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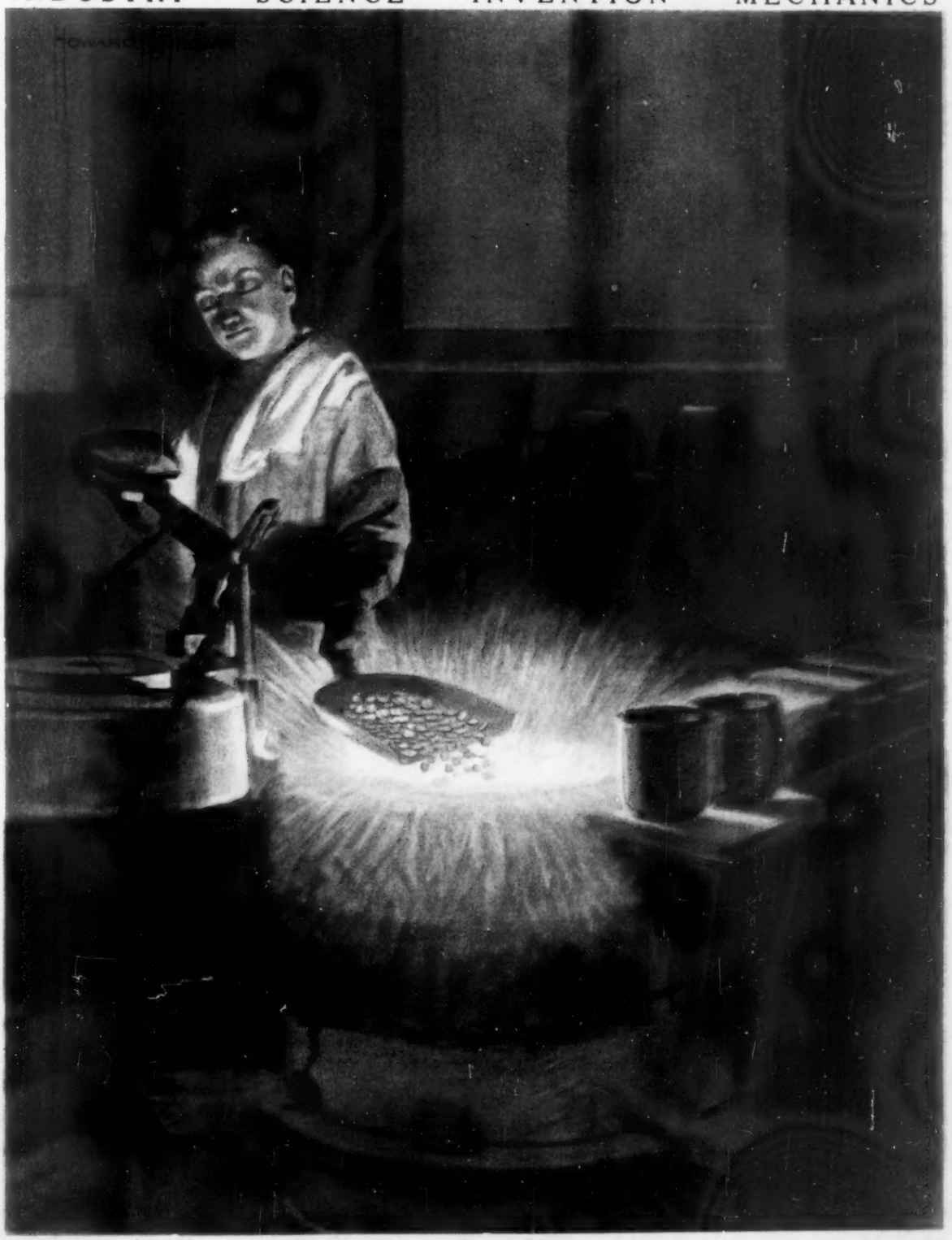
EXTRACTING OIL BY ELECTROLYTIC ACTION
A MECHANICAL AGE FOR THE FARM

SCIENTIFIC AMERICAN

A Weekly Review of Progress in

INDUSTRY · SCIENCE · INVENTION · MECHANICS



MELTING GOLD COINS IN THE UNITED STATES ASSAY OFFICE.—[See page 429]

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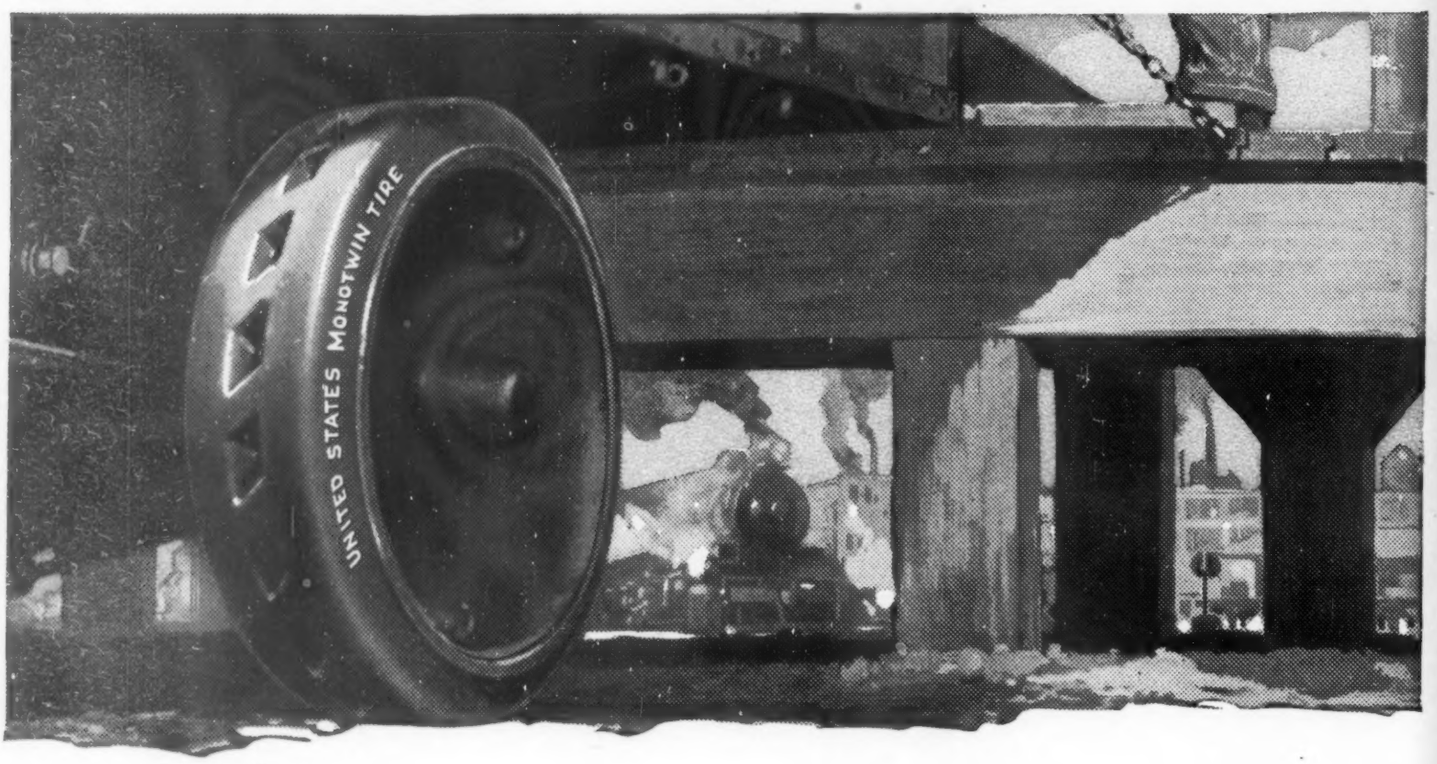
The Fastest Selling Solid Truck Tire in America — the MONO-TWIN



TALK to the truck owners of this country about *economy*—even an economy that may not be immediately apparent—and you will always find them ready and willing to listen to you.

When the United States Rubber Company announced the creation of its new Mono-Twin Solid Truck Tire, two months ago, it expected that truck owners would be interested.

What it didn't foresee was how quickly and almost universally they would appreciate the *results* towards which this company had been working.

* * *

Two months is a short time in which to have the results of years of scientific endeavor meet with such general and enthusiastic acceptance.

But truck owners all over the country have learned their lesson. They have followed the unsound and the unscientific to their logical conclusions.

They know now which way economy lies. And they are more than ever out to find it.

* * *

For those who overlooked the first announcement regarding the Mono-Twin, we reprint these few facts bearing on its economy:

It is built of *grainless* rubber—an exclusive U. S. creation—*non-splitting.*

Chemically joined to its base—ending base separation.

Its combination of rubber cross-bars and depressions *increase traction*—*dissipate traction heat*—act as a *non-skid* tread—enable the tread to *wear down uniformly* with no necessity for regrooving.

It carries a *heavier load* than two single tires of half the section width—adding to its *cushioning qualities,* reducing the wear on truck and driver.

Any U. S. Solid Truck Tire representative will be glad to give you further information.

Talk to him. He is a truck *tire expert.*

And specify the U. S. Mono-Twin when ordering your new truck.

United States Tires

United States Rubber Company

Fifty-three Factories

The oldest and largest Rubber Organization in the World

Two hundred and thirty-five Branches

Mo-lyb-den-um Steel

The American Super-Steel

and

YOUR GASOLINE BILLS

Gasoline is high. It may go higher.

The public demand is greater economy.

Economy, in a motor car, is measured by the extent to which *useless weight* is eliminated.

Whether little or big, a motor car is a *product of steel.*

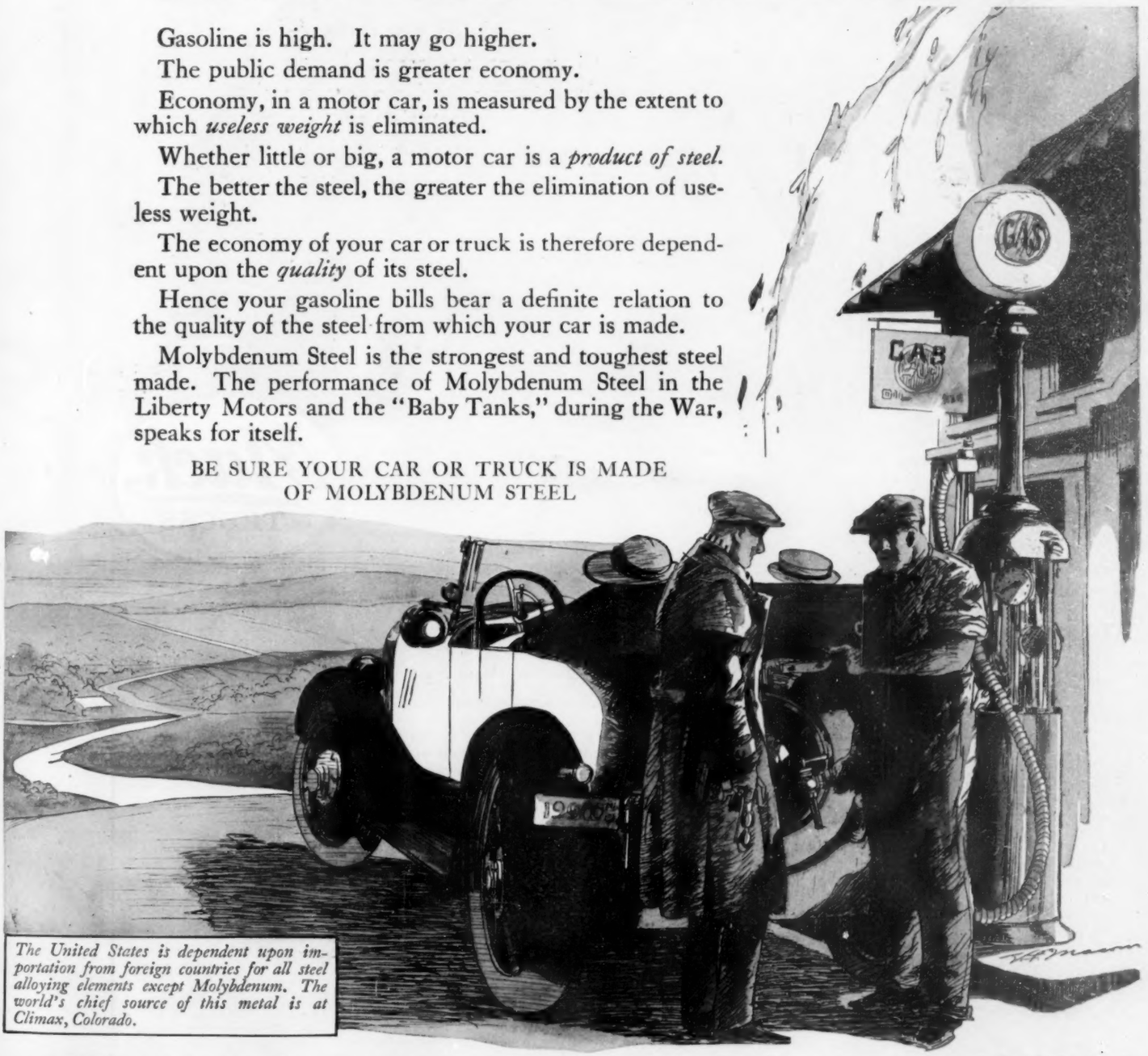
The better the steel, the greater the elimination of useless weight.

The economy of your car or truck is therefore dependent upon the *quality* of its steel.

Hence your gasoline bills bear a definite relation to the quality of the steel from which your car is made.

Molybdenum Steel is the strongest and toughest steel made. The performance of Molybdenum Steel in the Liberty Motors and the "Baby Tanks," during the War, speaks for itself.

BE SURE YOUR CAR OR TRUCK IS MADE OF MOLYBDENUM STEEL



The United States is dependent upon importation from foreign countries for all steel alloying elements except Molybdenum. The world's chief source of this metal is at Climax, Colorado.

Climax Molybdenum Co. *associated with* **The American Metal Co., Ltd.**

61 Broadway — New York

Climax Molybdenum Company is the largest producer of Molybdenum in the World.

THE SCIENTIFIC AMERICAN. October 23, 1920. Volume 123, Number 17. Published weekly by Scientific American publishing Company at 233 Broadway, New York, N. Y. Subscription price $6.00 per year. Entered as second-class matter June 18, 1879, at the post office at New York, N. Y., under the act of March 3, 1879.

for every requirement

"My Mack trucks, loaded to the top, frequently come up the Montgomery Street Hill—a grade of about 25 per cent. I am now figuring on a contract that will require ten more 7½-ton Macks, which will bring my total fleet up to twenty."—*From one letter of hundreds we should like you to read.*

THE Mack motor has sufficient reserve power for work far in excess of normal requirements. In the 3½ to 7½-ton models, the bore is 5" and the stroke is 6". While rated at 40 H. P., it has developed 74 H. P. on 100-hour continuous brake tests. It has a three-point suspension and is easily demounted.

Distinctive Mack engineering features, combined with 18 basic Mack patents, have developed the motor truck the world is talking about.

Capacities 1½ to 7½ tons. Tractors to 15 tons

Our latest catalogues, Nos. 13 and 39, contain a detailed description of the many exclusive features that have made Mack supremacy possible, together with the complete specifications of every model. Send for them today.

INTERNATIONAL MOTOR COMPANY, NEW YORK

"PERFORMANCE COUNTS"

SEVENTY-SIXTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXXIII. NUMBER 17] NEW YORK, OCTOBER 23, 1920 [15 CENTS A COPY 20 CENTS IN CANADA

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1. Chaise longe, made up from two of the chairs. 2. The bed for two persons. 3. Table, chairs and bed arranged to form an attractive living room and dining room combined. 4. Cupboard of the table opened to reveal the kitchen equipment. 5. Another cupboard of the table opened to show additional cooking utensils, as well as the sewing machine on the side.

The compact household which packs into a trunk or case yet which has all the comforts of the modern home

The Household That Packs into a Trunk

CONDENSED households seem to be the order of the day. A few years ago the world was accustomed to spacious homes in city and country alike. But with the housing shortage there has come a sharp retrenchment in household space, and ingenious architects are busily engaged in planning small and still smaller rooms in both new and old houses, while clever and enterprising inventors are developing convertible and nesting furniture which can be used to the best advantage in the small space now available.

The old scheme of one room for one purpose—the dining room, sitting room, bedroom, and so on—is fast going out of date. There is afoot a very definite tendency to make every room serve for several different purposes. Thus we find the living room replacing the parlor or sitting room, and this same living room not only serves throughout the day but is also provided with a davenport or other form of bed for use at night. At least one company engaged in manufacturing ready-cut houses is now featuring small houses in which every room, by means of closets and other devices, can be used for a variety of purposes. This is truly condensed housekeeping, is it not?

Now comes a young French inventor, M. Louvet, with an entire household which, when completely packed, measures 49 by 54 by 33 inches, thus permitting it to be packed in the large trunk or to pass through any door without difficulty of any kind. Yet the five pieces of furniture contained in the case cover a floor space of 78 by 103 inches when spread out. In these pieces are contained all the other combinations and accessories for the household.

An inventory of the Louvet compact households reveals the following items: A bed for two persons; metal bed spring, mattress and necessary sheets and other bedding; a child's cot, with springs and bedding; a table 49 by 30 inches; a side board with dishes for three persons; a pedal-operated sewing machine; a linen closet containing all the linens necessary for the household and a child; a chaise longe; two chairs for adults; a child's chair; a folding stool for adult and another one for a child; a children's bench; a piece of furniture serving as desk and dressing table; a revolving stool with a shaving glass attached; a lady's mirror; a lady's sewing table with all accessories; a carpenter's and metal worker's tool box; a stove for heating; a clothes-washing outfit with large tub that can hold as much as 130 quarts of water; and all accessories for a home such as lamp, pictures, clothes hangers, etc.

The table, which is shown in three of the accompanying illustrations, contains all the kitchen accessories. There is also a sewing machine which folds up on one side of the table, as shown. There are several drawers for odds and ends. Each object has its special place in a compact form, so that nothing rattles or falls out.

With two of the chairs a chaise longe is easily made. All the chairs contain compartments which hold all the necessaries for a bedroom. The double bed at the bottom has drawers and cupboards containing other accessories.

Changes Rule of Road

THE automobile brought with it in British Columbia an agitation to change the rule of the road, and spasmodically in this Canadian province for a dozen years there have been organized efforts to bring about the change. Along with Prince Edward Island, British Columbia has always "turned to the left," after the English fashion, since the days of first settlement. The rest of Canada followed the American rule of the road, which is also the Continental.

The British Columbia government decided at the last session of the Legislature to adopt the American rule, and the change will soon be put into effect.

Chief opposition to the change was from the electric railways, who claimed that heavy expense in altering equipment would be unavoidable. There were also the usual arguments that the "natural" way to turn is the left. Turning either to the right or to the left, experience shows, is largely a matter of habit, quite easily acquired, and with the advent of the automobile the most cogent argument for turning to the left—namely, that it enables the driver, sitting on the right, to watch the wheels in passing—has lost great caste. This objection to the right-hand drive caused automobile manufacturers to change to the left-hand drive, and the objection no longer existed.

In any event, British Columbia decided that it would be fairly simple for its population to "learn over" a rule of the road, to break itself of the old habit and form a new one. Surrounded by peoples using the American system, and with the automobile and automobilists from outside always urging standardization, British Columbia decided the practical move was to change the rule.

Historians say that charioteers in Roman arenas turned to the left, and that the legions of Severus, marching through Britain, kept to the left.

New Use for a Rare Element

NEW uses for rare metals or elements seem to be appearing constantly. The metal selenium is not a familiar one but is a by-product in the electrolytic refining of copper. Demand for it has been very light and its chief use has been in the glass industry, in photographic chemistry and in medicine. It has also been used to a limited extent in electrical work, because it possesses the peculiar property of varying conductivity according to the intensity of the light. Under the influence of light its conductivity may be 500 times greater than in the dark. As the result of research work carried out at the University of Wisconsin by Prof. Victor Lenher, a new property has been discovered which should open up a big field for the application of selenium and incidentally make it worth while for copper refiners to pay more attention to its recovery. In the form of selenium oxychloride it acts as a powerful solvent on certain organic substances. The unsaturated hydrocarbons, such as acetylene, benzene, and toluene, dissolve readily, while the paraffin hydrocarbons, such as gasoline, vaseline, and paraffin wax, are unaffected. Pure rubber, vulcanized rubber, asphalt, bitumen, and the casein glue used in airplane construction dissolve easily in selenium oxychloride, and it can be used in coal analysis to extract the bituminous material in soft coals.

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Freight Handling and the High Cost of Living

IN view of the number and diversity of the causes which are given for the present high cost of living, it may well be that the only fact of which the average citizen is absolutely sure is that the cost is high. As a matter of fact, present conditions result from a multiplicity of causes, some near at hand and readily recognized; others, so far as public observation goes, being more remote and liable to be entirely overlooked. Among these may be classed that part of the high cost of living which is chargeable to out-of-date and inefficient methods for the handling of freight at railroad and steamship terminals.

It is an amazing fact that in the land which is preëminent for the manufacture of labor-saving machinery, we should be making less use of such machinery in the matter of freight handling than some of the leading countries of Europe. How this condition has been brought about it would be interesting to discover, but probably we shall not be far from the truth if we say that it is traceable to that pronounced spirit of conservatism which in this matter of freight handling, as distinct from freight hauling, has dominated our transportation interests both on land and sea. This, however, is an explanation which does not explain; for in the hauling of freight, once they have got it on the cars, our railroads have shown a characteristic American ability to cut down costs by continually enlarging and improving their locomotives and cars; so much so that, today, we are hauling freight at a cost that is far below that of any country of the world.

Why is it that in the bringing of raw materials to our factories, in working these materials up into finished products and in hauling them from the factory to the consumer, we have developed handling machinery famous the world over, and yet have failed to make any commensurate use of such machinery in the handling of package freight at terminals and transfer points, both on our railways and at our great seaboard terminals?

How greatly the high cost of living is affected by failure to make full use of labor-saving appliances in the handling of mixed and package freight is shown by a comparison of the costs of hauling freight once it is upon the cars with the cost of handling it at the point of destination. Thus, we are told by Harwood Frost, writing in *Marine Engineering*, that the average expense of hauling a ton of freight 240 miles is 74 cents, while the average expense of handling the same ton of freight at the terminals is 75 cents, and he quotes as an example the case of the short haul between Philadelphia and New York, where the cost of handling at the terminals is $3.65, whereas the railroad cost for the 90-mile haul is only 27 cents. We are told that it costs less for the 1,300-mile marine haul from Havana to Boston than it does to transfer the same freight from one pier in Boston Harbor to another. Similarly, it costs more to transfer a barrel of flour from the car to the hold of a ship in New York than it does to carry it by that ship from New York to Liverpool.

The country is now engaged in one of the greatest commercial enterprises in its history, upon which it has already expended considerably over three billion dollars. We refer to the activities of the Shipping Board and the great fleet of over six million gross tons which the Board now has in its care. With this equipment we are endeavoring to win our proper share of the deep-sea-carrying trade of the world. In this effort we shall have to match our wits against the nations which, through long years of experience, have become thoroughly efficient in the building and routing of ships and who have established on a comprehensive scale all the complicated machinery which is necessary for the gathering and distribution of world-wide trade. We are handicapped by the fact that we have to build our commercial structure from the ground up, and we are under the severe handicap imposed by the obligations and restrictions of the Seamen's Bill.

Our crews are better paid, better housed, and by law we are obligated to carry a larger number of men than our competitors carry on a ship of the same tonnage. The only direction in which we can look to overcome the handicap against us is in the reduction of the turn-around by shortening the time which shipping must spend in our ports, and the most effective way and the only way in which this can be done is by utilizing to the utmost limit the various labor-saving devices such as electrical cranes, hoists, conveyors, tiering machinery and other handling devices that are used so extensively by our foreign competitors.

We understand that the Railroad Committee of the Chamber of Commerce of the United States has been making a study of this most vital question, and that constructive recommendations will shortly be made relating to the question of freight handling at terminals. Necessarily this will include both railroad and marine transportation. The report should be most widely distributed and a campaign of education undertaken with a view to getting the constituents both inland and on the seaboard to urge upon their Congressmen the need for taking hold of this vital question at once and with a liberal hand.

Motor Trucks and Country Bridges

IN view of the rapid increase in motor truck service in rural districts it is high time that the authorities looked into the question of the strength of the smaller country bridges and their ability to stand up under the increasing stresses to which they are being subjected by the weight and speed of motor truck traffic.

The benefits which have been conferred upon outlying farming communities by the rapid spread of the new system of freight transportation are so apparent, that it is certain, not only that rural motor truck service has come to stay but that it will be enormously extended. Not only will the total freight carried grow rapidly, but there will be an inevitable increase in the size and speed of the individual trucks.

The art of road building has progressed to the point at which we can construct roadbeds that will stand up under the most exacting service; but we question whether the bridge builder has kept pace with the road builder. It is certain that a careful survey of country bridges, made by competent bridge engineers, would discover hundreds of structures that are being stressed beyond the limits of safe and conservative practice.

In this connection we wish to draw attention to a most important element in bridge design, which only of late years has begun to receive the attention which its importance demands. We refer to the question of impact. It is only now beginning to be realized that, even in steel bridges of the first magnitude, the difference between the stresses due to static as against dynamic effect may be enormous. A train moving very slowly across a bridge is one thing—the same train rushing across the structure at from forty to sixty miles an hour is quite another, and the increase of the stresses due to the hammer blow of the flying mass, may concievably be from fifty to one hundred per cent.

The difficulty of making an exact determination of the dynamical effects of impact on the members of bridge structures is due, in part, to the want of suitable appliances. Laboratory tests on small-scale structures would teach us something; but we doubt if the data thus secured would be accepted by engineers as a sufficiently reliable indication of the actual impact stresses in the full-size bridge. The successful results of the investigation by Mr. Fowler of the Niagara Bridge suggest that the impact problem may be solved along similar lines. There is considerable divergence of opinion among bridge engineers; but it is probable that impact stresses increase as the square of the velocity of the moving vehicle.

Undoubtedly the effects of impact are felt most severely by the floor system, and proof of this is seen in the fact that, in the cases where country bridges have given way, it has generally been the floor system (floor beams, stringers or planking) that has failed. Instances of the complete collapse of the trusses are comparatively rare.

A survey of the highway bridges of the country would show that, although the trusses are generally sufficient for their work, many of the floor systems should be rebuilt. And in connection with this matter of impact, we wish to emphasize the importance of maintaining a true surface on the planking. To replace a worn down plank with one of the original thickness results in a heavy impact on the bridge, when a five-ton truck, running at twenty miles an hour strikes the obstruction—for such it is. The new plank or planks, as the case may be, should be adzed down to match the general surface.

We commend this subject of impact on highway bridges to the attention of road commissioners as one which calls for immediate action. Fast freight motor traffic, we repeat, has come to stay; our highways are equal to the new conditions, but too many of our highway bridges are not. They can be made so by a partial rebuilding at a cost that would not be excessive.

The Hudson Vehicular Tunnel

A RED letter day in the history of urban transportation was October 12th of this year, when Governor Edwards of New Jersey and Lieutenant Governor Walker of New York broke ground at the New York end, thereby inaugurating the construction of the vehicular tunnel beneath the Hudson River, the first great tunnel of its kind to be constructed in the new world. Tunnels of this character have been built before, notably the Rotherhithe Tunnel, London, and one beneath the Elbe at Hamburg. But these two, because of their shorter length, are not burdened with the great problem of artificial ventilation, which renders the construction of the Hudson River tunnel so formidable an undertaking.

The twin-tube structure will measure nearly one and one-third miles between end portals, and the outer diameter of each tube will be 29 feet. The Rotherhithe Tunnel has a span of 1,570 feet between the ventilating shafts, whereas there will be a stretch of 3,800 feet beneath the tide and between the off-shore ventilating shafts. Of these last-named there will be four, two near the pierhead lines and two inshore, near the tunnel entrances and exits. A cross section of the tubes shows that they will be divided horizontally by two partitions, the upper chamber being used for the outflow of the foul air, the lower chamber for the inflow of fresh air, and the middle chamber being devoted to traffic. The roadbed will be 20 feet wide, with a clearance of 13 feet 6 inches between the floor level and the under side of the ceiling.

To ventilate the tubes there will be provided 65 electrically-driven fans which will be sufficient to effect a complete change of the air 32 times every hour. The operation of the ventilating system at maximum capacity will call for the annual expenditure of $280,000. The traffic is estimated for the first year at 119,000 horse-drawn vehicles and 2,686 motor vehicles, and in the tenth year, the figures show a potential one-tube traffic of 68,000 horse-drawn as against 5,916,000 motor vehicles. Twenty years from the opening of the tunnel, it is estimated that the dual route should be handling a total of 15,800,000 motor vehicles in the twelvemonth.

The cost of the tunnel is now put down at $28,669,000, which will be equally divided between the two States. It is expected that, in eleven years, the operating revenue will have yielded sufficient income to amortize the cost of the tubes, and that at the end of twenty years each State will have to its credit a surplus of $33,635,000, or sufficient to build another double-tube tunnel. In three and a half years the tubes should be open, and the intolerable congestion and delay of the present ferry service will, mercifully, become a thing of the past.

Electricity

A Plug Bushing Which Grips the Cord. — For taking the strain off the binding screws of plugs a new bushing has been developed by an electrical manufacturer. The hole in the bushing has a number of inwardly projecting bosses which serve securely to grip the outer surface of the wire around its entire circumference. Thus the strain on the wire is taken by the bushing and not by the binding screws. The threading is standard ⅜-inch iron pipe size. It is therefore possible to attach the cap to socket handles, etc.

A Self-Cleaning Lighting Fixture. — An electric fixture which cleans itself every time the light is switched on or off has been placed on the market. The fixture consists of a reflector, a pull switch, a cord, and a cleaning device comprising two wiping blades. Every time the cord is pulled to operate the switch it simultaneously brings the two wiping blades into action. Each blade makes a complete revolution, one against the reflecting surface of the reflector and the other against the lamp bulb. In this way the dirt is swept off both lamp and reflector.

Combination Fan and Heater.—There is nothing new in the idea of using an electric fan for the purpose of distributing heat about a room, but no one had attempted to combine the electric fan and the electric heater until the advent of the recent device. This device is a standard fan, to the guard of which is attached a nichrome heater. The fan and the heater have independent connections, attaching to any socket, and combined, in the domestic size, require 600 watts. The fan-heater is made in larger sizes for industrial purposes. In summer time the fan alone is operated, so as to serve for cooling purposes.

Briquetted Plates for Storage Batteries.—A new type of storage battery is described in a recent issue of *Science Abstracts*. This new battery, which is of Swedish origin, appears to be a modification of the nickel-iron alkaline cell as made by Junger, the chief characteristic being the method of making up the plates from briquettes of active material, which are automatically fed in between two perforated nickel-steel strips. These strips inclosing the active material are manufactured in lengths folded together and fitted into a steel frame. The complete electrode is then put through a rolling process to ensure perfect contact between the active material and the strips.

Radio Telephone for Seaplanes.—It is reported that the U. S. Navy is now making use of radio telephone sets for seaplanes with which a transmission radius of over 150 miles has been obtained. The transmitter radiates at two wave lengths, 1,600 and 600 meters. For the former wave length a trailing wire antenna of 0.0004 mfd. is employed, for the latter an emergency aerial of 0.00026 mfd. The transmitter is supplied with two three-electrode tubes of the pliotron type. One tube is employed as an oscillator for the production of radio-frequency currents and the other tube is employed as a modulator and as an amplifier of the voice currents that are communicated to it by the microphone.

Coolidge's X-Ray Tube.—A summary of a lecture delivered by Dr. W. D. Coolidge before the Röntgen Society in England appears in a recent issue of the London *Electrician*. It was said that progress in the development of the X-ray tube was possible only when the art of manufacturing and working tungsten had been mastered. Dr. Coolidge dwelt in considerable detail on the present method of purifying and reducing wolframite and the operations of sintering the powdered tungsten metal into blocks and plates from which disks could be prepared, when white hot, suitable for the targets of X-ray tubes. The essential requirements of a target in an X-ray tube were stated as follows: (1) A high melting point to permit sharp focusing of the cathode rays without fusing the target. (2) A high atomic number to secure a large yield of X-rays. (3) A high thermal conductivity to enable the heat to be got rid of. (4) A high heat capacity to withstand intense momentary discharges as in diagnostic work. (5) A low vapor pressure to prevent the metal being deposited on the walls of the bulb.

Astronomy

Masses of the Nebulæ.—One interesting corollary of the epoch-making studies of nebulæ recently carried out at Lick Observatory, and reported in Vol. XIII of its publications, is that the rotational velocities of several bright-line nebulæ, as determined with the spectroscope, serve, with certain assumptions, to indicate the masses of these bodies. In three cases the masses indicated are 162, 3.7 and 18.8 times that of the sun. The planetary nebulæ in which rotational effects have been observed appear to be at least several times as massive as the sun, but the fainter and apparently smaller planetaries are probably less massive, in some cases, than the solar system.

The Subterranean Clock Room of the Argentine National Observatory is described by M. L. Zimmer in the *Astronomical Journal*. This room is interesting for the reason that it maintains a constant temperature without any auxiliary apparatus. A hole 10½ meters deep and 2 meters in diameter was sunk and the room was constructed of re-enforced concrete, treated with a water-proof mixture. The Riefler clock in the observing room is synchronized with one of the two standard clocks underground, so that there is never any necessity for descending into the lower room. Surface vibrations have little or no effect upon the room, but earthquake shocks would stop the clock, and there appears to be no remedy for this difficulty.

Interchange of Wireless Time Signals.—A large part of the May, 1920, number of the *Monthly Notices* of the Royal Astronomical Society (published in July) is devoted to articles on a subject now very prominent in astronomical circles; viz., the exchange of wireless time signals by the great observatories of the world. Some of the objects to be attained by concerted work in this line are thus set forth by Professor Sampson: (1) A more exact knowledge of longitudes, implying the final settlement of the most obstinate of geodetical problems. (2) Consistency in time determination throughout the world. (3) Elimination of small remaining errors in systematic right ascensions of stars. (4) Improvement in the knowledge of clocks as timekeepers and as chronographic instruments. (5) Some reaction to the benefit of radio research. Great progress has already been made in apparatus for obtaining autographic registration at the observatories of time signals from high-power radio stations in remote parts of the world. Thus Greenwich Observatory now regularly records the signals from Paris, Nauen, Lyons and Annapolis, and occasionally those from Darien. Efforts have been made, without success as yet, to detect at Greenwich the signals from San Diego, Cal., and Honolulu. An international program will probably be adopted at a meeting of the Commission de l'Heure in 1922.

The Total Solar Eclipse of September 20, 1922.—Plans are being made to utilize this forthcoming eclipse for a further test of the Einstein hypothesis, for which purpose it will be more suitable than the eclipse of 1923. The field of stars in which the sun will be located at the time of the eclipse has recently been photographed with an astrographic telescope stopped down to 7 inches aperture, using rapid plates, and a diagram of the field is published by the British astronomer royal in the *Monthly Notices* for May, 1920. Information concerning possible stations for observing the eclipse has been communicated to the Royal Astronomical Society by Mr. A. R. Hinks. There are three convenient locations: (1) Bandidu, in the Maldive Islands, is on the central line, with a duration of 4 minutes 10 seconds and an altitude of 34 deg., at which good photographs may be obtained. It has the advantage of occurring at 8:10 a. m., local time, before the temperature has risen; there will consequently be little or no fall in temperature during the eclipse. (2) Christmas Island, in the Indian Ocean, although some distance from the central line, has a duration of 3 minutes 42 seconds, with an altitude of 78 deg. The eclipse occurs here at noon. (3) The western coast of Australia is impossible, on account of lack of communications, but eastern Australia is favorable. Cunnamulla, in the interior, is accessible by railway. With a duration of 3 minutes 45 seconds and an altitude of 26 deg. good work might be done here

Automobile

Fit Piston Rings to Cylinders.—The practice in many repair shops is to fit the rings to the pistons, but not to the walls of the cylinders, with the result that space is left between the ring and the cylinder wall through which the compression leaks. The object of fitting rings in this manner is to save time and trust to luck that the rings through wear will eventually conform to the walls of the cylinder. A ring that is fitted correctly conforms to the cylinder wall as soon as it is put in. Such a ring should be lapped in with fine carborundum and oil, grinding it to a fit with the cylinder wall of the cylinder in which it is to be used.

A New Type of Windshield Cleaner recently put on the market is a chemically treated cloth which is wiped over the glass, after the latter has got wet. The result is to break up completely the tendency of the water to stand in drops on the glass or run over it in streams, and since it is this formation that impairs vision, the cloth is decidedly effective. The water, after application of the cloth, stands in a uniform thin and altogether transparent film over the surface of the glass—a film so thin that there is no appreciable refraction and vision through it is excellent. The manufacturer states that one application of the cloth is enough for 24 hours of wet weather, but this statement we have had no opportunity to check up.

Clear Out Cooling System in the Spring.—To give a thorough cleansing to the cooling system, disconnect the short section of hose between bottom of the radiator and pump, connect the garage hose to the water pump and a longer section of hose to the bottom pipe of the radiator and lead it outside of the truck. Plug the overflow tube with a cork or rubber stopper. Turn on the water after starting the engine and it should be pumped through the water jacket and radiation till it runs clear. If the radiator and water jacket of the engine are found to contain considerable scale or rust, it may be necessary to flush the system out with a solution of hot water and washing soda and it may even be desirable to allow the washing soda solution to remain in the water system over night to make sure the scale is loosened.

Trucks Save Farms from Flood.—The value of a motor truck in an emergency was never better illustrated than on April 26, when floods threatened to destroy the levee protecting the Spring Lake farming district. It was necessary to secure 25,000 cement sacks to be filled with sand and earth to protect the crumbling embankment. These sacks were located in various sections of Central Illinois and a fleet of motor trucks was utilized for the purpose of collecting them. One of these owned in, and starting from, Bloomington, made the run with 3,000 sacks, weighing 2 tons, from Bloomington to Manito, 60 miles in 3 hours and 10 minutes, moving over poor roads, rough in many places and interspersed with mud holes. This performance demonstrates that with decent highways and motor truck equipment the United States could be made immune from serious effect upon business due to railroad strikes and greatly increase its ability for defense in event of a foreign invasion.

Small Fields Are Expensive. — On a number of Missouri farms that have been keeping complete cost account records, in coöperation with the University of Missouri College of Agriculture, an average of the labor required for different size fields of corn shows that the 35-acre fields average 46.6 per cent more economical of man labor and 31.4 per cent more economical of horse labor than the smallest fields of three acres each. The average amount of labor required per acre for the different size fields was:

Average size of fields	Yield in bushels	Man hours	Horse hours
3 Acres	32	31	51
8½ Acres	30	25	45
12 Acres	30	25	43
18 Acres	33	23	39
23 Acres	29	16	33
34 Acres	26	17	35

These figures are for average size horse-drawn machinery. The tractor capable of drawing the larger horse-drawn machinery would emphasize still more the economy of the larger fields.

Making the Hetch-Hetchy Dam Itself

How California's Big Water Development Is Carried On with Its Own Water

By J. F. Springer

LARGE engineering works often involve subsidiary constructions of considerable size whose primary function is merely to promote the main operations. Thus, in the great Hetch-Hetchy enterprise, which is ultimately to supply San Francisco with 400,000,000 gallons of water per day or whatever part of this immense amount will be needed, it has become advisable not only to build motor truck roads but to construct a standard gage railroad 68 miles long. Another large subsidiary undertaking is the power station which is to supply electric energy for the operation of power-driven appliances which are to be engaged upon the construction of the great Hetch-Hetchy Dam, one of the main features of the whole enterprise, and of an 18-mile tunnel of the main aqueduct.

The power development is for construction purposes—at least primarily. The water for it comes from the beautiful Lake Eleanor whose outlet has been dammed by a multiple arch dam and whose area and impounding capacity have been thus increased. Lake Eleanor is at a considerably higher elevation than the power house and the difference in level is by no means all used in providing the hydrostatic head back of the pressure water entering the turbines. The bed of the Eleanor Creek at the site of the dam is 2,347 feet higher up in the mountains than is the power station. The water rushes down Eleanor Creek and into the Cherry River. At a point on this stream some 3½ miles from the power house, a dam has been constructed whose function it is to divert sufficient water from Cherry River to operate the turbines. This diversion dam diverts the water into a channel or conduit. From this the water flows into a steel penstock which runs down a steep incline. The capacity of the canal is 200 second-feet. This part of the construction is by no means uniform. One mile is of canal lined with concrete; one mile of the total is devoted to five tunnels; and 1½ miles in all to three flumes. While the canal is lined, the tunnels are not, except at portals and a few scattering locations. The construction of the tunnels has proven pretty hard work, as the rock formation is of granite. However, rock spoil derived from the tunnels was found useful as coarse aggregate for concrete work. The flumes were constructed of wood. The minimum section is 5 x 6½ feet. Ultimately, this temporary construction is to be replaced by rock tunnels. The concreted canal and Lake Eleanor Dam are to be retained as permanent parts of the general work.

The power house is 12 miles distant from the site of Hetch-Hetchy Dam. Naturally, this dam is the means of impounding the water of Hetch-Hetchy Reservoir. This dam and reservoir are also, like Eleanor Dam and Lake, farther up in the mountains than the power development under consideration. The great dam is, however, at an elevation considerably lower than the smaller one. Hetch-Hetchy Reservoir will discharge its waste into the Tuolumne River. The water for San Francisco will, however, be delivered to a tunnel which will, for a considerable distance, carry the supply down along a line roughly parallel to the Tuolumne River on one side and the Hetch-Hetchy Railroad on the other. This tunnel will be 12 miles in length and will deliver its water to a great power house. After passing through this station, the water will enter a long stretch of tunnel. Whenever the water from Lake Eleanor is to be sent on to San Francisco, it will naturally be passed into this long tunnel as well as that from Hetch-Hetchy Reservoir. This tunnel will be 18 miles long and will extend from Early Intake, near both the power houses already mentioned, to Priest Regulating Reservoir. The Cherry River power station supplies current for construction purposes on this great tunnel. There are two large pieces of work which this power house is to care for, one being the tunnel and the other the great dam. Its location is well adapted to serve both. The most distant point of the tunnel will be at its lower end some 18 miles away in the direction of San Francisco. The big dam is 12 miles distant in the opposite direction.

The tunnel to Priest may be divided into two sections. The one nearer Early Intake is perhaps 6 miles long and has a great mass of rock overhead. The other section is some 12 miles long and is farther down the line. It is also covered with a great mass of rock. The point of junction, however, where the one terminates and the other begins is in the bottom of a big ravine where the south fork of the Tuolumne River cuts across the line of the aqueduct. The entire 18 miles of tunnel may be viewed as a single section of downgrade of unvarying inclination. The tunnel diameter is 10¼ feet and the difference in level between terminal portals is 150 feet. The capacity of this tunnel is necessarily, at least equal in amount to the contemplated delivery at San Francisco. There are in all four portals, two being intermediate. The Hetch-Hetchy Railroad touches practically all of them. This is important in the matter of prosecuting construction.

The portal at Early Intake is far below the level of the railroad; so that all the material delivered here has to be lowered. This is accomplished by means of an inclined tramway 3,800 feet long. An electric hoist is located at the upper terminus and supplies the power for operation. The steepness of parts of the incline may be judged by the fact that the grades run up to 78°. There is also another tramway at the portal 18 miles farther down the line at Priest. This is a counterbalanced affair and is used to lower supplies from the railroad. Construction plants have been set up at the termini, at the crossing of South Fork and at two shafts in intermediate locations. Standard mining equipment has been given the preference when providing these plants, one object being to reduce the cost of repairs and the amount of spare parts that would need to be carried in stock. Among the appliances in use are motor-driven air compressors, rotary blowers, storage battery locomotives, side-dump tunnel cars provided with roller bearings, rock drills, etc. A mucking machine has been in satisfactory use in the tunnel heading from the Priest portal. This machine secures the spoil from the blasting operations at the heading, elevates it and delivers to tunnel cars. The use of a machine for this work in a considerable tunnel in hard rock is understood to be rated as more or less experimental. It is thought, however, to have been advantageous here in view of the shortage of labor.

At the two shafts, there are naturally two headings per shaft. Duplicate equipment was supplied in order to permit rapid work on both. One of the shafts is known as Big Creek shaft. Before 1919 had closed, this shaft had been carried down to its full depth of 646 feet and chambers at and below tunnel grade had been excavated at its foot. These chambers were starting points for the headings. A rather unusual method of handling the water was employed on this shaft. When the excavation had got down nearly half way, a considerable flow of water entered the shaft; but lower down the flow moderated. A method usual in shaft sinking proceeds by arranging a sump in the bottom of the excavation and pumping the water up from this level. Here, this would have meant, when the shaft had reached its full depth, the hoisting of a large part of the water from twice the depth at which it entered the excavation. At the depth of 330 feet a pumping station with sump was constructed and all water from upper levels intercepted and pumped out.

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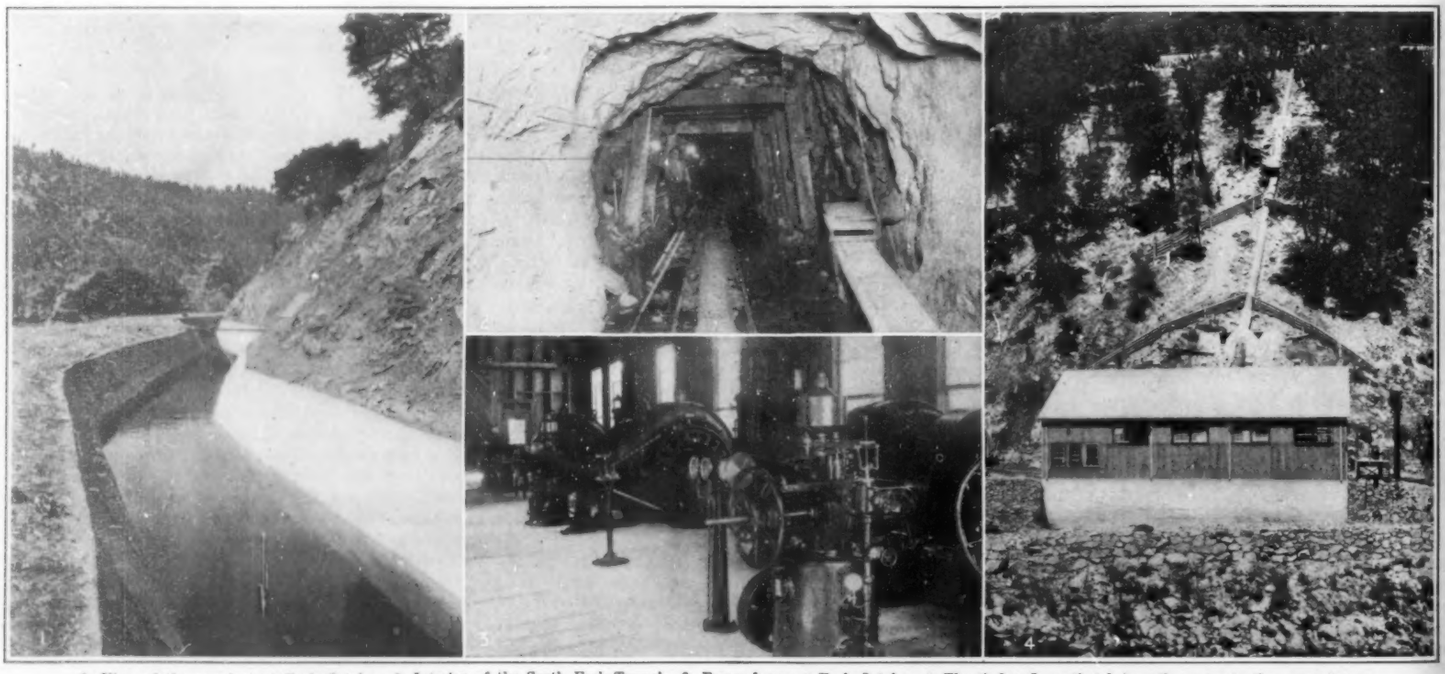
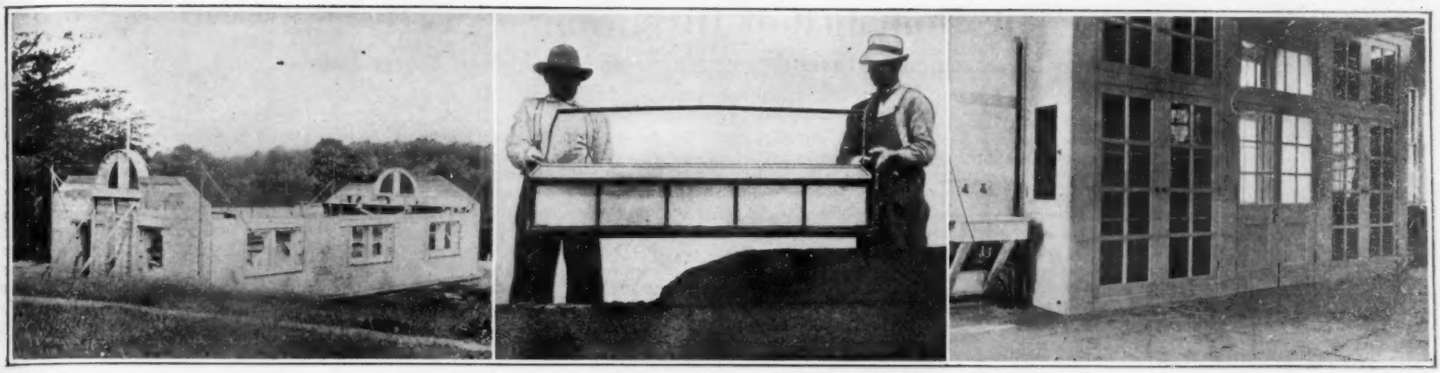


1. View of the aqueduct at Early Intake. 2. Interior of the South Fork Tunnel. 3. Power house at Early Intake. 4. The timber flume that brings the water to the power house

Some of the work in connection with the subsidiary construction of power houses on the Hetch-Hetchy project



Left: General view of the experimental laboratory building recently constructed in Washington, D. C., for the Department of Research in Terrestrial Magnetism, Carnegie Institution. *Center:* Special mould employed in forming the walls of the building. *Right:* Double doors used in interior of laboratory building and some of the non-magnetic piping

Details of the non-magnetic experimental laboratory building constructed at Washington, D. C., for research in terrestrial magnetism

Piloting the Ship with the Ears

By George Gaulois

THE day is not far distant when sailors will no longer fear fog and the darkness of the night. It will no longer be necessary to lose much valuable time at the entrance to a harbor, waiting for favorable conditions as is the case with our present method of piloting ships. The radio cable, developed during the world war for guiding friendly ships through thick mine fields and through narrow waterways at night, has been found to mean more in peace time than it could ever mean in military operations. This device, which is now being introduced in several leading countries, is almost certain to reduce the dangers of fog and darkness to a minimum.

Briefly, the principle of the radio cable, as it is called, is to employ a cable through which flows a 500-cycle alternating current. Ships intending to use the cable while passing in and out of waterways are provided with a pair of coils which intercept the electromagnetic waves emanating from the cable. By noting the relative strength of the waves reaching each coil, it is possible for the ship's navigator to determine when he is approaching the cable, on which side it is, and, with the sound in the head 'phones equal for both coils, when he is riding astride the cable. Once astride, it is relatively easy to follow it along and thus steer a correct course. In certain installations two cables are laid, each either carrying a current of different frequency so as to cause a difference in the tone of the signals, of the same frequency but with certain interruptions of a fixed kind so as to represent readily identified signals. In either event the navigator can determine which is the outgoing and which is the incoming cable, and in that manner select the proper one and thus avoid the danger of collision with a vessel coming in the opposite direction.

On October 6th last the United States Navy conducted an interesting public test of the sixteen-mile radio cable laid from near the Ambrose Channel Lightship to Fort Lafayette in the Narrows, or in the main waterway approaching the port of New York. With his pilot windows covered with heavy canvas, as shown in one of the accompanying illustrations, Commander Norton of the destroyer "Semmes" piloted his vessel along without a mishap or a single hesitation. He picked up the cable and guided the "Semmes" by "listening in" and steering to port or starboard as the volume of sound indicated his position.

It was the good fortune of the SCIENTIFIC AMERICAN to obtain details of the radio cable installation in New York Harbor some time before the present test. Indeed, complete details of this novel installation are to be found on page 195 of the August 28, 1920, issue. Readers who missed that number are referred to it for a complete drawing of the cable and the technical details.

In the case of the "Semmes" the installation consisted of two large receiving coils mounted above the water line on either side of the steel hull. These coils, it will be noted from another one of the accompanying illustrations, resemble nothing so much as large but empty black frames. These coils are each connected with a two-stage vacuum-tube amplifier, which amplifies the weak currents induced in the coils by the electromagnetic waves emanating from the radio cable, some four hundred times. The current, being of an audible frequency, is led directly to a pair of head 'phones. In the case of this test the cable current was interrupted so as to spell "N A V Y" in the usual telegraph code, and these signals registered in the head 'phones in the form of soft but positive clicks. A simple switch makes it possible for the navigator to listen in on either coil and so determine the relative force of the electromagnetic waves reaching each coil.

It is interesting to note that the radio cable has been developed by Earl C. Hanson, a young Californian, whose radio work dates back to the early days of amateur wireless on the Pacific coast.

Rust Preventives

WHENEVER machinery is shipped or stored the prevention of rust upon polished surfaces is a problem. It has been an attractive problem to chemists and the market now affords several compounds designed to protect the metal surface, to cling tenaciously to it and yet be easily removed under certain conditions. One of the compounds not only prevents the formation of new oxide or rust, but makes preliminary cleaning unnecessary, takes care of any moisture that may be present upon the surface, and is even said to remove any traces of preliminary rust which may be present when the compound is applied.

A Magnetic-Proof House for the Workers

By Harry A. Mount

A BUILDING of unique construction, in which not an ounce of steel or iron is used, has recently been completed in Washington for use as an experimental laboratory for the Department of Research in Terrestrial Magnetism, Carnegie Institution.

The outer walls are of double concrete construction, with 2½ inches of dead air space between. The reinforcement is brass rods, tied together with brass tie wires.

The building requirements for the research work contemplated were (*a*) unusual rigidity and strength, (*b*) non-magnetic construction, and (*c*) insulation against sudden external temperature changes.

After careful consideration the double-wall monolithic construction was adopted. The walls were built up with a Van Guilder machine. This consists of four steel plates held parallel with proper braces. The walls are built up tier by tier, a rather dry mixture of concrete being tamped in the mold, and the machine being moved on along the wall without waiting for the concrete to dry. A stucco finish is placed directly on the outside wall when completed and plaster is placed directly on the inside wall. The sill courses about the building and under the windows and the columns at the entrance of the building are of artificial stone with a fine granite and mica surface, and were all cast in place with the walls.

Further insulation against sudden temperature changes is provided by double windows and double doors and by a double ceiling of plaster-board, enclosing a dead air space of 10 inches between.

Because of the unusual requirements and specifications, particularly those for non-magnetic construction, it was not possible to secure a contract for the work, which had, therefore, to be undertaken by the Department. It was impossible, even, to secure bids for the special mill-work required, all of which had to be done in their own shop. The cost of construction, despite the increased expense necessary, was about 30 cents per cubic foot of volume enclosed, comparing very favorably with prevailing rates for ordinary lumber construction.

The equipment of the building, other than the special

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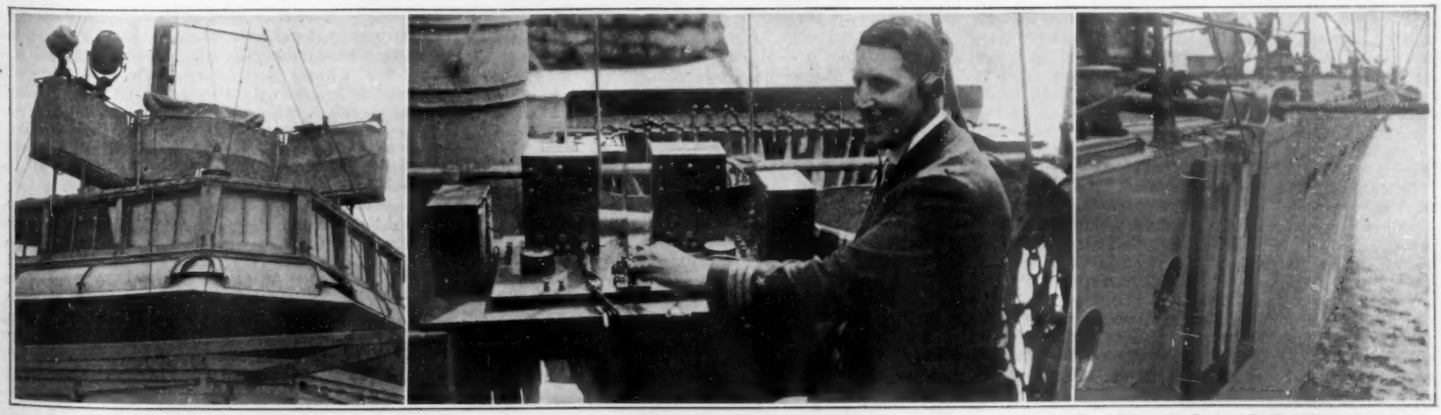


Left: Navigating bridge of the U. S. S. "Semmes," showing the heavy canvas screens which shut off the view of the navigating officer during the radio cable test. *Center:* Radio cable receiving set aboard the "Semmes," with two two-stage amplifiers, sensitive electric meters, switch for connecting to either coil, and pair of head 'phones very much in evidence. *Right:* One of the coils mounted on one side of the steel hull

Views of the first test of the radio cable installed in the approach to the port of New York

The Romance of Invention—XVIII

William Leroy Emmet—Inventor, Engineer and Builder of Power Plants

By C. H. Claudy

AMONG the eclipsed luminaries of invention, the men so much less well known to the general public than to the technical world and particularly the engineering world, is William Leroy Emmet, of the blood of Robert Emmet, and of the staff of the General Electric Company, for whom he is a consulting engineer. In the shops of that organization Mr. Emmet has done much important work, notably in the development of the mighty turbine-manufacturing industry (the tale of that Curtiss turbine has been told in this series) and the electric drive for ships, primarily battleships, but lately for merchant ships.

Of these accomplishments more in a moment. But perhaps the greatest of all is one still in process of testing, but which its deviser and builder believes will work an enormous change, not to say a revolution in steam plants throughout all industry. This is the mercury-vapor boiler and engine. Let it be said at the outset that Mr. Emmet is extremely particular that he neither claim nor be given more credit for the development of this apparatus than he deserves. He is careful to state that others besides himself have worked upon binary vapor power plants, and that the fundamental idea of this one came to him from Bradley, himself a famous inventor. He also wants it made plain that no one in the great Schenectady plants carries a conception through to execution unaided. He has competent assistants, materials, opportunities, and so must give to the organization, as well as to the help of individuals, the credit which is due.

THERE are certain scientists, inventors, discoverers, pioneers, the very nature of whose work makes them well and widely known—the Edisons, the Wrights, the Marconis. There are others, doing just as important work, the nature of which is such that the general public hears of them but little, their renown being confined to narrower circles of engineering, philosophical or scientific societies and associations. The man in the street who could name the inventor of the "grasshopper" cut-off gear used on all modern locomotives, or recall the name of the discoverer of the moon of Mars, or explain the genesis of the long series of experiments and discoveries which made the modern electric light out of that feeble glowing bulb which first startled the world so many years ago, would be well informed indeed. It is the story of one of these great inventors of little general repute that Mr. Claudy tells us in this account of Mr. Emmett, who would doubtless prefer to be known as inventor of the mercury-vapor turbine.—THE EDITOR.

William L. Emmett, inventor of the mercury-vapor power plant, and the first Curtiss vertical turbine, in the development of which he played a prominent part

But with this out of the way, it is nevertheless true that the mercury-vapor turbine, as applied to power production in connection with steam plants, is Mr. Emmet's personal contribution to applied engineering which may well rank high above either the electric drive or the development of the Curtiss turbine, the latter a contribution to the family of prime movers which practically put the reciprocating engine for electric generation out of business. Put in as brief and simple a form as possible, the mercury vapor plant is one which increases the possible efficiency of the whole from the maximum of twenty per cent, representing the best we can do in extracting energy from coal and delivering it in the form of mechanical power, to thirty-five per cent and possibly more.

In its elemental form the working of this idea may be thus described. Heat is taken from coal and made to vaporize mercury. The mercury vapor is made to rotate a turbine, in which process it makes some, but not all the heat-energy available as mechanical power. The mercury vapor is then condensed into mercury and used over and over again. In the process of condensation from mercury vapor, at a temperature of eight hundred degrees, to mercury in the liquid form, the heat is extracted from the vapor and made to produce steam in the water in the condensing system. This steam is used to turn the turbine of an ordinary steam plant.

If the mercury-vapor turbine were eliminated from the system what would be left would be a source of heat, a mercury boiler, a condenser extracting the heat from the mercury vapor and producing steam, which steam runs a steam turbine. In this condition (without the mercury turbine) the whole outfit would operate much as does an ordinary boiler and turbine, with such slight losses of heat as might be occasioned by the use of a mercury boiler and condenser instead of the ordinary steam boiler for the production of steam.

Putting the mercury-vapor turbine into the system decreases the efficiency of the whole, considered as a steam-making plant, very little, and extracts from the mercury vapor, before it is used, power to heat water to make steam from which more power is extracted. The net result is that, used in connected with such a furnace as normally is required to produce two thousand horse-power from a steam plant, the combination should produce 3,200. The mercury turbine gives 1,560 horse-power, of which 1,200 is clear gain.

The problems solved in the development of this apparatus are much too numerous and difficult even to be catalogued. Perhaps the first and most vital was the question of leakage. Mercury is both heavy and expensive and its vapor is poisonous. It is essential that throughout the system no vapor of mercury leak out, if the air about it is to be kept non-toxic. It is also essential that as little loss as possible be permitted, because with mercury at a dollar a pound and a pound being less than two cubic inches in extent, any considerable leakage would be disastrously expensive.

The cure for leakage is twofold. First, the whole system is so designed that every joint, from boiler to pipe, from pipe to turbine, from turbine to condenser and back again, is a welded joint—a "jointless" joint in other words—through which neither vapor from within nor air from without can leak because there is no place for it to leak through. Second is the provision of piped containers fitted over all places where leakage *might* occur, such as the end of the turbine shaft, and the keeping of a vacuum suction always in this container, drawing off and returning to the system any vapor of mercury which might get out.

There are engineering advantages in a system of this kind quite outside of the power-gain from a given number of pounds of coal. There is no scale to worry the steam producer, in a mercury boiler, since the mercury does not oxydize under the conditions in which it is used. The mercury vapor has no effect upon the boiler so that element of the outfit is practically indestructible. A relatively small quantity of mercury is made to serve for a large one by the rapidity of the cycle. In a design now proposed about 30,000 pounds of mercury will be used and about 230,000 pounds vaporized per hour at full load. Later designs may need a much smaller quantity of mercury in the boiler. The mercury runs in a complete cycle of liquid, vapor, turbine, condenser, liquid, almost seven times in an hour. The plant may be used for the generation of steam alone by the operation of a by-pass, cutting off the mercury vapor from its turbine and making of it merely a means of conveying heat from fire to water.

This engine, mercury-vapor boiler and steam system, be it understood, is not a theory but a fact. A complete installation has been running in the huge boiler room at the power plant at Schenectady for some time, and while in many ways an experimental structure, it has demonstrated that the problems in connection with its construction and operation have been solved. Exteriorly it appears much as any steam boiler outfit with some odd looking pipes, boxes and excrescences above. Interiorily it would present a difficult problem even to an experienced steam engineer; Mr. Emmet stated that he doubted much whether even a competent power man could take it to pieces and explain the reason for its construction if he had not the key in the words "mercury vapor."

A great power company in a New England city has examined the Schenectady machine and ordered one for its own use. This is now in process of manufacture, and should be in place and operation within a year. It is obvious that if one power company gets hold of a power-developing unit which will show a thermal efficiency equal to that of the Deisel engine, while still using coal, it will not be long before others follow suit.

Mr. Emmet, who has a strong dislike for the word "prophecy" as far as he and his work is concerned, believes that there is a future for this idea not only in huge sizes but in small plants. "I see no reason why it cannot be operated efficiently for automobile trucks and even pleasure cars," he said. "I think the day will arrive when steam locomotives are equipped in this way. Any system which will save nearly half the coal used is of tremendous importance not only in saving money, but in saving the transportation of fuel. It may be possible to produce by this method airplane engines with weights of less than three pounds per horse-power developed, and of very high economy."

The electric drive for battleships, which is so rapidly displacing other forms of machinery designed to deliver power to the propeller has been developed at Schenectady under the personal supervision of Mr. Emmet. Lately the question has arisen as to its availability for hulls other than fighting ones, and its designer now believes that electric drive for merchant ships will be increasingly demanded and used. For a time the success which attended the operation of geared turbines interrupted the current of thought which tended to develop the electric drive for large commercial vessels, but recent improvements in electrical designs and operation of such power plants, with a very high degree of superheat, have again turned attention to this form of propulsion as perhaps the most economical method, particularly for large hulls and long runs.

The advantages are many, as stated by Mr. Emmet, and include a saving in space, which is of tremendous importance in the operation of vessels which must carry fuel not only for the outward but the return run. In such case fuel is being carried for half the distance traveled at cargo rates. Under such circumstances, the fact becomes of acute importance that the more space is occupied by propelling machinery, the less is the earning power of the vessel. There is no room for argument regarding the saving of space in an electric drive over the geared turbine. In a typical example Mr. Em-

(*Continued on page 438*)

Painted Coffee

A Trick of the Trade That Is Little Known Outside Brazil

By Robert C. Brown

WHAT has the paint or chemical manufacturer got to do with the coffee industry? Nothing at all; ninety-nine people out of a hundred will speak right up, and some will shout out of their turn in order to be heard, to inform you that it is preposterous to associate manufacturers of paints and chemicals with the raisers of coffee who have invested hundreds of thousands of dollars in their plantations. Some may go on and give you facts and figures about coffee, which is rapidly becoming the universal morning and after-dinner beverage. They will even tell you that coffee grows only in certain countries and that the best coffee comes from here or there and that Brazil is the greatest producing country in the world of this delicious little bean.

While the manufacturers mentioned above really hold nothing in common with the plantation raiser, they are friends, though indirectly, with Brazilian shippers of coffee. And when you mention such a fact to your friends they will immediately laugh and advise you to see a doctor for an examination of the little gray matter you have, commonly known as brains. But stick to your point, and ask if they have ever seen or drunk coffee that has been painted, then the laughter will be renewed and in all probability it will be louder and longer than before. Wait until the hilarity has subsided before launching your big guns broadside and watch your listeners sit up and take notice.

Yes, there is such a thing as painted coffee. And the painting is done right in Rio de Janeiro, the only city in the world where coffee is painted before being shipped to certain ports in this present topsy-turvy revolving globe. And not only is coffee painted, but it is also washed. Coffee is painted black, blue, green and yellow and is also bleached in some cases to give the desired hue required by the buyer. Then there is also such a thing as polished coffee.

Painted, polished or bleached coffee is not shipped to all parts of the globe for the simple reason the health authorities of some countries have had laws passed to prevent its entrance. Today the majority of this kind of coffee is shipped either to the northern ports of Brazil or to South Africa. Chile still buys some coffee after it has been treated. It is not so many years ago when painted and polished coffee was shipped to the ports in the United States as well as to Europe.

When some of the local shippers of coffee receive orders for painted coffee, the polishing or painting plants are immediately made ready for the operation. Whether the coffee was grown in the State of Rio de Janeiro, Sao Paulo, or Espirito Santo, the work is done here. The coffee in its natural state is given to one of the six firms in this city which does such work, with special machinery. To paint or polish coffee it is necessary to dump it into cylinders which are equipped with batting paddles. Each cylinder holds 702 pounds of coffee. The man in charge of the cylinders drops in the coloring or polishing material needed to give the desired finish. In painting or polishing, the material is applied a tablespoonful at a time until proper results are obtained. The batting paddles which revolve at a high rate of speed do the rest of the work.

Some coffee sold to South Africa after it has been treated has a bluish green luster to make it look like Central American or Porto Rico coffee. Some buyers in South Africa prefer their coffee to imitate Java coffee, which is yellow, and their wishes are gratified with the aid of coloring and machinery. In making black coffee for the northern ports of Brazil, graphite is used to help solve the problem. Others prefer what is known as white, but after treatment it shows up more as a cream color.

Painting or polishing cylinders hold six bags and it generally takes about twenty minutes for each operation, so working at top speed each machine can turn out approximately eighteen bags of coffee in an hour's time. After the coffee has been treated a trap door on the side of the cylinder is opened and the coffee is run into bags. After sixty kilos have been deposited in each bag, it is sewed up and final preparations are made for shipment.

The ingredients used in painting or polishing coffee are powdered aluminum, graphite, powdered paints blue and green, carnauba wax, talcum powder and ochre—the latter produces a vegetable paint.

It is only the natural coffee that is treated. On arrival at its destination and before it is sold for domestic consumption the coffee is roasted. In the latter operation the beans lose the effect of their treatment in Rio. The material used in no way affects the coffee and the majority of people could not tell by the taste that the beans had been treated.

Painted or polished coffee is a business in itself. If any one firm or individual handled this kind of coffee alone a nice profit would be made on a year's business. About 300,000 bags of this style are shipped annually to South Africa. Coffee is also washed before shipping and the process of washing is held by some as a trade secret.

Two American firms ship coffee of this type and have their own machinery for the work. In addition to this equipment one company has several separating machines to separate the different sizes and types of coffee as well as two blowers attached to the same machine to take out any sticks, dust and broken beans. In its plant there are also two mixing machines with a capacity of 11,000 bags to make one lot of the same quality of coffee, as well as two automatic weighing machines, which insure the buyer that each bag held sixty kilos when originally shipped.

When or in what city the coffee painting and polishing process came into use is not exactly known, but it is said the Germans were the first to employ such methods. It is said the coffee buyers from German houses bought coffee in the various coffee growing countries and it was then shipped to Germany for treatment. After being treated and made to look like Java, Central American or Porto Rico coffee it was re-exported to different countries where such coffee was required.

When the war broke out this industry, like many others, was lost to the Germans. There was still a demand for painted coffee and the buyers turned to the coffee shippers of this city. Here their demands were met and today Rio de Janeiro has the distinction of being the only coffee-planting city in the world, and the second greatest coffee-shipping port in the universe, bowing only to Santos.

Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

An Appeal

To the Editor of the SCIENTIFIC AMERICAN:

The American Meteorological Society has learned that the staff of the Zentralanstalt für Meteorologie, the national weather service of Austria, numbering with their families 67 persons, are in urgent need of food and other bare necessities of life. This establishment has always taken a conspicuous part in the development of meteorology and geophysics, under the successive directorship of such eminent scientists as Kreil, Jelinek, Hann, Pernter, Trabert and Exner, and the tragic situation of the Austrian meteorologists appeals strongly to the sympathy of their colleagues in this country. Those who desire to render aid in this emergency can send food drafts direct to Dr. Moritz Topolansky, secretary of the Zentralanstalt für Meteorologie und Geodynamik, Hohe Warte 38, Vienna XIX, or through the secretary of the American Meteorological Society, Dr. C. F. Brooks, Weather Bureau, Washington, D. C.

Washington, D. C. C. FITZHUGH TALMAN.

Again the Tractor vs. the Horse

To the Editor of the SCIENTIFIC AMERICAN:

In your department "The Motor-Driven Commercial Vehicle," I note in an article under the date of September 18th, entitled "Horses Displaced by Tractors," the following statement: "The number of horses displaced by tractors in the corn belt is largely determined by the number it is necessary to keep for corn cultivation and other work current at the same time which the tractor cannot do."

If this is the condition of power farming in the corn belt I am greatly surprised that they are so far behind the younger agricultural district of the Southwest.

The writer is farming about 250 acres of which 25 acres is in alfalfa and the balance Puna long staple cotton. Previous to motorizing the ranch it was necessary to use fifteen head of horses and mules; at present we would not need to keep a single horse were it not for the fact that it is not advisable to use tractors on the very bad road from the ranch to the gin and even this problem would be better handled by a sturdy truck and two or three trailers than by horses.

We have one four-plow tractor of the caterpillar or crawler type and two six-cylinder, two-row motor cultivators. With the big engine we do all plowing and disking and such heavy work as moving the hay derrick, etc. The motor cultivators which can be equipped with draw bar and converted into light handy tractors in about an hour's work, or equipped with pulley for light belt work, will cut the cotton stalks, pull the harrow or drag, plant, cultivate more efficiently than horse-drawn machinery and handle mower, side delivery rake, loader and even the stacker fork, and do any odd jobs of hauling, grading, etc.

In planting the big engine will go ahead with ten-foot tandem disk and spike harrow, followed by one cultivator with drag and the other with two-row planter. In this way three men can easily plant from twenty to thirty acres a day. As to cultivators it is hard to estimate their superiority over a horse cultivator as each machine will cover about twenty acres daily; they break down far less of the plants in turning; never tire in tearing out grass and what is the greatest advantage in this hot country, will put in a full day's work in temperatures over 100 degrees where stock can hardly accomplish more than four or five hours. Also by reason of high arch construction they can keep on cultivating about two weeks after the horse-driven tools have been stopped and the crop laid by.

We employed two ordinary negro farm hands of no tractor experience to handle the machines, the writer making all adjustments and repairs. As to economy, two men did more and better work than could be accomplished with five men and ten head of stock. The fuel consumption is about 1¼ gallons of gasoline per hour and a quart of oil daily. The power plant gave practically perfect service, the only repairs being in the driving and cultivator parts. The cost is about the price of four good mules harnessed and two single-row horse-drawn cultivators.

In conclusion, I would state that if I were obliged to give up either part of my equipment I would prefer to use horses in the spring for plowing and disking and tractors during the hot summer for cultivating and hay harvesting, exactly the opposite from what seems, as described in your article, to be the custom in the corn belt. The day of the "Motorized Farm" is not coming, it is already here.

Winterhaven, Cal. T. B. GOODWIN.

[We are convinced that Mr. Goodwin's experience, while doubtless characteristic to some extent of his part of the country, is not representative of the country at large, and necessitates no recession from the opinion which we expressed on this subject in our issue of May 29th. Nevertheless, we are glad to print it as an indication of the extent to which the replacement of horses may go under the most favorable conditions. —THE EDITOR.]

The New Science

To the Editor of the SCIENTIFIC AMERICAN:

Although psychology is now regularly being taught in our colleges, there appears to be considerable mystery about what this science really is, and how it can be applied to advantage. It has been said that the several writers in this field have discussed systems of their own, thus presupposing a lack of harmony, or agreement, as to fundamental law.

There is a saying that "In Nature the obvious is seldom true." The one who got up this phrase, undoubtedly was a master of psychology, and to all intents it is half of its definition. The other half would then merely be some expedient for disclosing the real truths. If this is so, a psychologist would indeed witness a world burdened by a myriad of fallacies.

There may be a question whether the true psychologist is born or made, even as a poet or an artist is predestined, but in the meantime, if in this confused era we could obtain from psychology its truest message, its best logic, it would quite properly be in a psychological moment. A discussion of this subject would doubtless be a very live one, and would help to bring a comparatively neglected science to the front.

New York. A. F. SHORE.

A Mechanical Age for the Farm

What Nebraska, Through Its State University, Is Doing to Bring It About

By R. P. Crawford

PROBABLY no better proof of the fact that the farmer today has a large part in the engineering development of this country has been afforded in recent years than the dedication last April of the agricultural engineering building of the University of Nebraska. This structure, just completed at a cost of a quarter of a million dollars, is probably the finest building of its kind in the country. Let it be said that when the architects set out to draw the plans for this structure they had no precedent to go on, because a building of this kind had not as yet found a place on an American university campus. They had been teaching civil engineering, mechanical engineering, electrical engineering, and just about everything but the branches of engineering that deal especially with agriculture. It is true some colleges gave a few shop courses, but they were usually dubbed shop work or farm mechanics and were simply offshoots of the other departments.

But today agricultural engineering represents a line of work all its own. For instance, the University of Nebraska is now engaged in a series of tractor tests, the like of which has never before been attempted in America. For it is now a state law that no tractor can be sold in the State of Nebraska until all of its advertised ratings have been actually proved in a series of tests carried on at the university and a permit issued by the State Railway Commission. Heretofore tractor manufacturers have been content to make their own tests. It is true that there have been competitive tests carried on every summer but at best these were only a few field tests. But now practically every claim of the manufacturer will be tested and his advertising must live up to the actual tests.

It is undoubtedly true that the farmers of this country are entering upon one of the greatest mechanical ages that they have ever witnessed. The growing shortage of the ordinary farm hand is doing much to make the farmer turn to mechanical appliances, and, as I write, my desk is piled with letters telling what tractors have done in the Middle West, and how they have saved the extra hired hand. It is true that not in every case have they been a success, but the last few years have witnessed a great change in sentiment among the farmers of the country. This has been due largely to the perfecting of the machines. For every really successful invention that can be offered to the farmers of the country, there will be thousands ready to give it the glad hand.

The farmer is becoming better and better educated and today farm homes throughout the Middle West have conveniences that a few years ago would have been only for the cities. A few years ago a detailed survey was made of the 142 homes in Orange township, Blackhawk County, Iowa, before the present wave of prosperity had struck the country. Fifty-six of these homes were tenant homes. The accompanying table tells what the survey showed regarding modern conveniences.

Does not this record seem surprising when one recalls that more than a third of the homes were tenant homes? Undoubtedly if this survey were to be made today, the record would be still better. Of course all of these were country homes.

Just what kind of courses, do you suppose, are taught in the agricultural engineering department of the University of Nebraska? First, of course, comes the gasoline engine with the tractor and automobile leading the way. There are courses for the junior and senior in the university who expect to make agricultural engineering a life work, there are courses for the student in the agricultural high school run in connection with the college of agriculture, and finally there are tractor and automobile courses for the farmer who can take only a few weeks off in the middle of winter to study farm mechanics. These latter courses are practically the same as those offered at dozens of automobile and tractor schools throughout our country, which charge a good fee for a few weeks' instruction. The main difference in the case of the university work is that it costs the student practically nothing.

There are courses in woodwork, where the students learn to do any woodwork around the farm, and courses in forge work. And then comes rural architecture. Do you remember some of those funny old farm houses and some of the one-room schools, every one just alike? Every student here must make some practical designs of modern farm buildings. Then there is work in designing the farmstead. I wonder if the factory efficiency men who spend so much time telling just how every machine should be placed know that the farmer has to solve just such problems himself. The other day a professor of agricultural engineering figured out that if a farmer travels fifty times a day between his house and barn and the distance is 400 feet, in the course of a year he does about the same thing as walking from Omaha to New York. By having the barn 200 feet from the house he would be able to save about thirty-five days' time that in the other case would be spent walking. In fact today in all of our better agricultural colleges, the planning of the farmstead buildings is studied with as much care as the efficiency expert plans the factory.

Every type of machinery that the farm boy comes in contact with on the home farm is studied, with practical tests in the field. In the basement of the building is a large earth plat, about 12 feet wide and 156 feet long, which provides a practical testing ground for tillage implements the year round. An electrically-driven test car operates on rails at the side of the track. The implement to be tested is hitched to this car and horsepower calculations are made with a dynamometer. This has nothing to do with the tractor testing which is carried on as a separate branch of the work.

Of course every farm is equipped with pumps so that subject must also enter into agricultural engineering. In one laboratory there are five wells, one of them being of a large size and permitting of the use of an irrigating pump. There is a weir box for measuring the flow of water. Irrigation and drainage is another branch of the work. In fact, all through the Corn Belt today one will find tile drainage systems being installed and land once thought worthless reclaimed and producing bumper crops. Irrigation engineering, the application of water to the land, and irrigation laws are taken up.

For the student who aspires to become an agricultural engineer there are courses in agricultural physics and five rooms in the new building are given over to that subject. There is also a laboratory devoted especially to handling farm grains.

The main part of the building has a frontage of 180 feet and is 76 feet deep. There is a rear wing, 84 by 140 feet, which takes care of the forge shop, the motors and automobile laboratories, ignition and carburetor laboratory, grain handling lab-

(*Continued on page 438*)

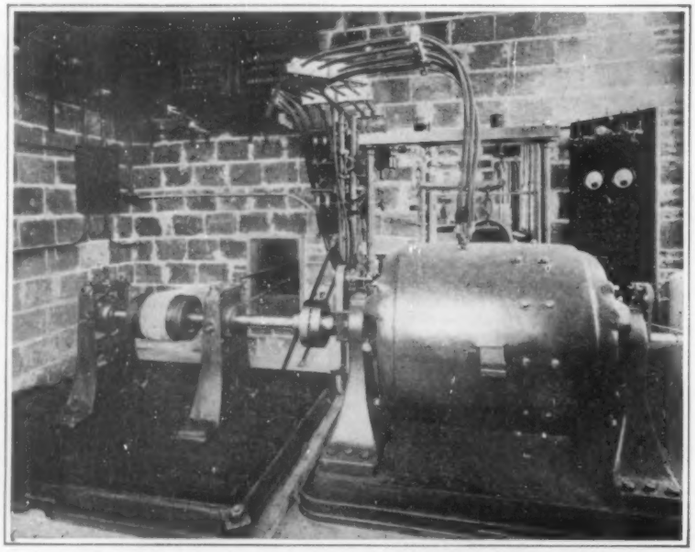
Agricultural Engineering Building at the University of Nebraska

Modern Farm Statistics at a Glance

A careful census of the 142 farms in a single Iowa township showed:

Number of homes with running water	57
Number of homes with electric lights	16
Number of homes with gas lights	47
Number of homes with power washers	68
Number of homes with vacuum cleaners	76
Number of homes with furnace, hot water or steam heat	72
Number of homes with telephones	132
Number of homes with gas cook stoves	29
Number of families having automobiles	75

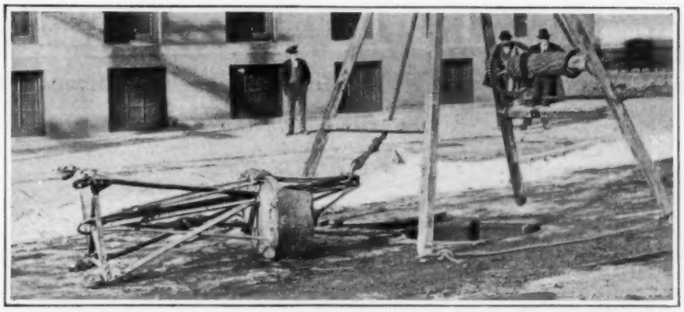
Dynamometer car (left) pulled by tractor (right) in a cold-weather test of the tractor



The electric dynamometer used for tests of horse-power developed on the belt

A Machine That Cleans Sewers

IN order to keep the sewers of Salt Lake City in good working condition, a special sewer-cleaning machine has been devised that is bringing good results. It is built of structural shapes and has wheels that keep the scoop from coming in contact with the bottom of the sewer. Ropes are attached to both ends of the machine to be used if any serious obstacle is encountered in the sewer, but as a usual thing the sewage is sufficient to carry the machine through safely from one manhole to the next without the use of the rope at all. Three of these scrapers are in use, being designed for sewers ranging from 42 to 64 inches in diameter. It has been found that they bring the best results when the disk has a diameter 1¼ inches less than that of the sewer. This dimension restricts the flow past the machine to an annular space of ⅝ of an inch.



Salt Lake City makes use of several of these machines for cleaning its sewers

Fuel Oil Versus Coal on French Railways

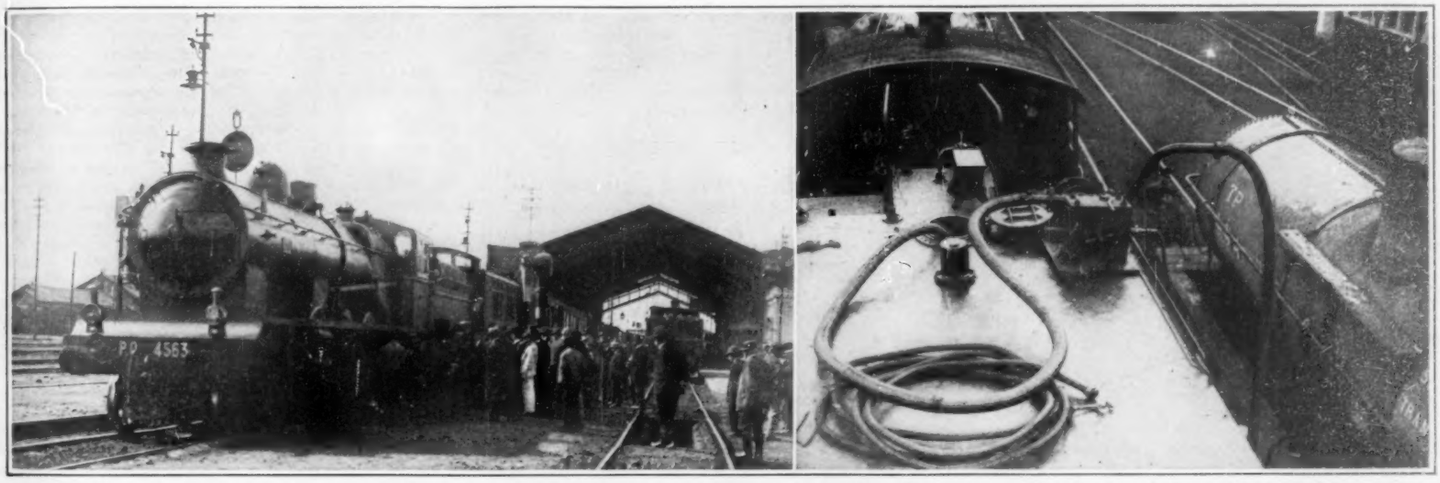
THE great scarcity of coal has caused the French railways to turn to fuel oil for operating their steam locomotives. Already the Paris, Lyon and Mediterranée Railway Company has transformed some of its motive power from coal to fuel-oil consumption, which is about to be followed by the Chemin de Fer de l'Etat, or State-owned railway, and engines at its shops at Saintes, in La Rochelle section, are now undergoing changes for experimental purposes.

Much attention is being directed to the announcement that the first-named railway company is planning to equip 200 locomotives for fuel oil and install numerous storage reservoirs of from 40 to 100 tons capacity at various points on its lines.

The accompanying illustrations show a test with a Pacific type French locomotive arranged for fuel-oil firing. This locomotive made a flawless run between Paris and Tours, during which the passengers were surprised by the smoothness of operation and the absence of smoke. Among the many advantages claimed for fuel-oil operation over coal on French railways are: Less work for the fireman; ease of controlling the fire, which makes it possible to economize fuel when the locomotive is not operating at full power; simple storage of fuel; greater heating capacity for the same weight; automatic shutting off of fire in case of accident, thus eliminating the danger of conflagration in a wreck.

The first shipment of 7,000 tons of fuel-oil ordered by the General Commissioner of Petroleum has been received for distribution and the Minister of Marine has announced that he will place a large amount of oil now in stock at the disposal of the commissioner.

The general interest shown in industral circles in connection with fuel-oil replacing coal should open a large field for the American product and oil-burning appliances and devices of various kinds in France. During the war large amounts of petroleum products entered the port of La Rochelle, where an English subsidiary of an Amrelcan concern maintains a depot of large capacity.



Pacific type locomotive equipped for fuel-oil firing, and a view of the tender of the same locomotive, showing top of fuel tank and the small steam-driven pump which pumps oil from a tank car to the tender's tank

Does Cold Kill Plants?

SOME very interesting experiments have recently been carried out to discover the effect of frost on vegetation. As is well known many plants are killed to the ground in the winter although the rootstocks which are protected by the soil live and are ready to shoot again with the coming of warmer weather. If it were simply the action of the cold that killed the plant the roots would certainly be destroyed for the ground in which they are situated is frozen solid. There is the best of reason for believing that it is not so much the cold as the excessive loss of moisture that really destroys the vegetable tissue. The upper part of the plant is subjected to a continuous evaporation and the loss of moisture cannot be made good seeing that the roots are in solidly frozen ground.

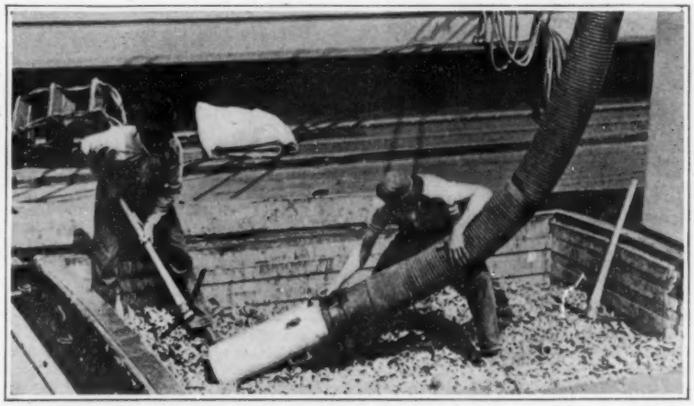
This evaporation during dry frosty weather is much greater than is commonly supposed. A chunk of ice weighing nineteen and a half pounds was hung among the branches of a small oak on February the 2nd. When the ice was taken down on the 14th of the month it was found to weigh eighteen pounds. All the time there had not been the smallest relaxation in the frost and, almost every day, the thermometer touched the zero point. Yet during this time a compact mass of ice lost nearly 8 per cent of its total weight in evaporation.

Later, on February 27th, another piece of ice was suspended from the tree, only this time it was placed in a pan so that no water should be lost in the event of mild conditions setting in. The ice and pan and the supporting wire weighed twenty-four pounds. On March the 24th, when only water was left, the entire arrangement weighed eighteen pounds. Thus, in a little less than a month, more than twenty-five per cent of the moisture had vanished through evaporation.

When these points are considered it will be realized that the moisture which the unprotected plant is called upon to give us is very considerable indeed. In the face of such a showing it seems altogether reasonable that the observed damage to standing vegetation in winter is a matter of evaporation. By covering the plants with soil, straw, or anything that will check evaporation, much may be done to carry the plants through the winter and this although it is not possible to keep the cold at bay.—By *S. Leonard Bastin.*

Carbonic Acid as a Fire Preventer

IN spite of all precautions fires frequently occur in places where large quantities of coal are stored. Under present conditions such coal fires are a source of particular danger, where so many war stores are still lying around. The German *Steam Boiler and Engine Driving Journal* now states that at a large coal dump in Dortmund the coal is now being stacked up in conjunction with the use of carbonic acid, the acid being used in the same way as is commonly employed when coaling ships. Carbonic acid is, of course, much heavier than air and thus always fills thoroughly even the lowest parts of the coal bunkers. The process is especially suitable when storing coal in high receptacles.—By *Arthur J. Keane.*



This suction tube sucks up the copra in the ship's hold and delivers it to freight cars some distance away

Suction as an Unloader of Ships

THE same force which enables the housewife to suck the dust out of carpets and draperies and dusty corners is now being applied in more ways than one to simplify the work of the industrial world. One of the latest applications is to unload ships carrying copra and other similar cargoes.

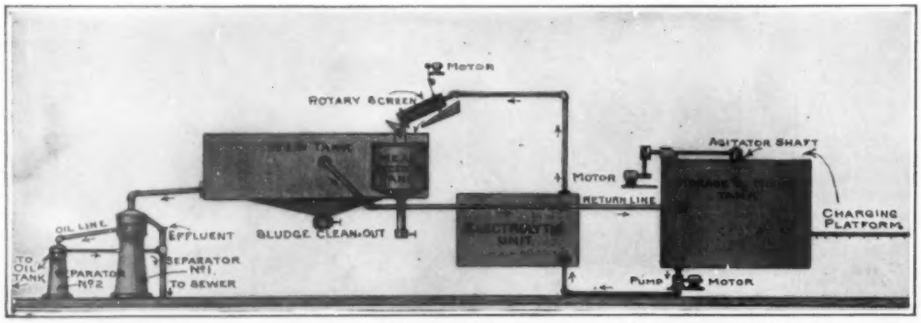
Our illustration shows the end of a suction tube at work in the hold of a steamer loaded with copra. The suction tube sucks the copra and deposits it in freight cars standing on tracks some distance away. This system has just been installed at the Parr terminals in Oakland, Cal., and is reported to be operating successfully with a very appreciable saving in both time and labor.

Extracting Oil by Electrolytic Action

A Recently Developed Process Which Bids Fair To Be of Economic Moment

By Robert G. Skerrett

ONCE again we have an example of laboratory research put to commercial service, and science shows us how we can greatly reduce our present wasteful practices and amplify to a notable extent the measure of marketable output obtainable from a given quantity of raw materials. This step forward is the direct result of a discovery made by George D. Rogers, a young chemist, graduated from the Massachusetts Institute of Technology. His professional work brought him in touch with the fish-oil industry, and it was not long before it dawned upon him that the prevailing methods had decided shortcomings.



Separator No. 1 is really a skimming apparatus which does not quite free the material from the weir tank of water and a percentage of the suspended solid matter. Separator No. 2, however, serves the purpose of a clarifier and discharges only clear oil. Should the material in the receiving section of the weir tank give evidences of incompletely treated matter, the charge can be returned to the mixing tank for a second run through the electrolytic unit. Ordinarily the breaking down in the unit would be sufficiently effected in one passage

Operative cycle of the electrolytic process for the extraction of oils

Mr. Rogers set himself the task of finding means by which more oil could be extracted from the primary stock; and he seems to have succeeded far beyond his expectations by evolving a process capable of much wider adaptation than at first imagined. The work-sized demonstrating plant now in operation at Gloucester, Massachusetts, is proving extremely efficient, and today is handling a variety of fatty or oleaginous substances in a fashion that reveals the usefulness of electricity in a new field. It is competing with the try-pot, the water bath, and the steam-jacketed kettle, and the results are somewhat revolutionary and of much economic significance.

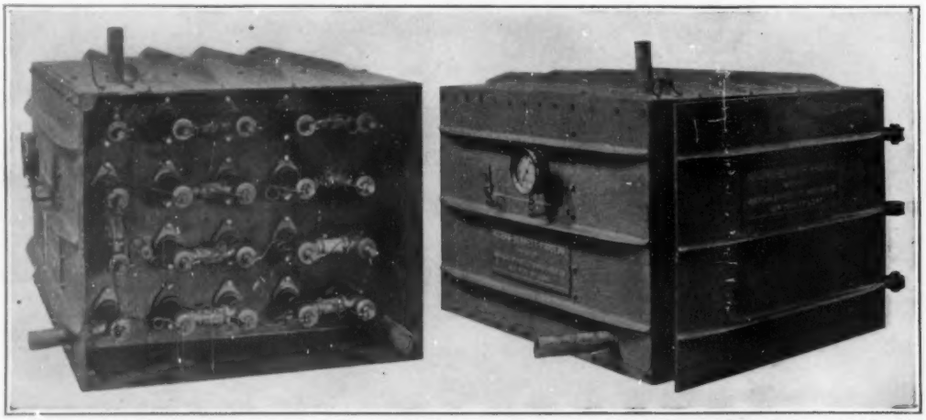
We learn from the latest figures supplied by the U. S. Bureau of Fisheries that our annual yield of "aquatic oils" of all kinds has averaged for a number of years about 5,400,000 gallons. The importance of these oils has increased by reason of their widening applications, especially since methods of preparation have been developed, such as sulfonation, oxidizing, heat treatment, and hydrogenation, which have made them fit or better suited to employment. We can probably best illustrate what this latest process promises if we explain the usual procedures in the extraction of oil from cod livers, for instance.

It is officially said that "sun-tried" oil represents anywhere from 20 to 40 per cent of the total quantity of oil produced. It is superior to that rendered by cooking. It is obtained by putrefaction of the livers and, as may be imagined, the natural process takes a somewhat protracted period. Very little of this cod-liver oil is used for medicinal purposes. The quicker procedure consists in cooking the livers, and in this two general methods are followed: First, by a water bath, a wood or coal fire supplying the needful heat, and, second, by steam, in either case, the rendering takes from 2 to 3½ hours; and the temperature at no time should exceed 200 degrees Fahrenheit. It seems that it is absolutely necessary to abridge as far as possible the time the livers are subjected to heat in order to secure a really choice grade of oil.

According to the U. S. Bureau of Fisheries: "For the production of the clearest and lightest medicinal oil, the livers should not be exposed to a greater heat than 100 degrees Fahrenheit, and that only for about 45 minutes. This, however, is not feasible because the quantity of oil produced in that case would be too small to make the business profitable. The time must, therefore, be extended as far as practicable without detracting too much from the quality." So much for the state of the art. Now let us see what the laboratory work of Mr. Rogers and the mechanical equipment designed by Robert P. Bennett represent in the way of an advance.

From the time the raw cod livers are placed in the mixing tank and the oil issues from the final separator the procedure does not take at the outside more than three minutes! The actual release of the oil from the fat cells is accomplished in an electrolytic unit, and from that point on the process is devoted to the separation of the oil from the water, sludge, solid matter, etc. The extraction of the oil amounts to almost 100 per cent of the oil content in the raw livers; and the passage through the electrolytic unit takes less than a minute.

ELECTROLYSIS bids fair to affect profoundly that diversified industry which is now engaged in the extraction of oils, oleo, and tallow from fatty sources. These products play a prime part in our daily life in numerous directions. As foods, as medicaments, as the foundation of soaps, as dressings or fillings for leather, as lubricants, as ingredients in paints, and so on, we use each twelvemonth many millions of dollars' worth of these commodities, and the demand is steadily growing. And that is why we have asked Mr. Skerrett to tell us about a new and remarkable process for the extraction of oil by electrolytic action.—THE EDITOR.



Left: An interior frontal view of the electrolytic unit with the door swung clear. The continuous flow of the material under treatment, from coil to coil, is made possible by rubber couplings. The rubber hose is used for the purpose of thus electrically isolating contiguous coils from one another. The apparatus can be taken apart whenever necessary to facilitate cleaning and replacements. *Right:* A 20-coil electrolytic oil-extraction unit showing intake pipe at top of case and discharge conduit at the lower left side. The front is hinged to permit ready access to the electrical connections of the various coils.

Electrolytic oil-extraction unit used in the successful tests of the new process

The electrolytic unit of the apparatus consists broadly of a rectangular box of steel containing a number of straight sections of 2-inch pipe joined to one another by rubber hose. Each of these pipes, known as "coils," carries a concentric rod of carbon one inch in diameter, reaching from end to end of the metal tubes. This leaves an annular channel half an inch wide around the carbon rods, and through this the macerated liver and salt water are driven by a gear pump. The mixture goes successively through all of the "coils" before issuing from the electrolytic unit. The purpose of the hose connections is to insulate from one another the various pipes or cells.

Each carbon rod is insulated from the enveloping metal tube, and the electrical connections for each pipe and each rod are independent, the carbon rods forming negative electrodes and the pipes positive electrodes. When current is flowing, the circuit is completed through the material carried by the electrolyte. The electrolytic action thus induced effects the extraction of the oil, by causing the fat cells to discharge their contents. The explanation of the phenomenon is that the passage of current between the electrodes destroys the balance between the electrolyte and the matter held by it in suspension, and in consequence an osmotic force is set up which brings about the bursting or breaking down of the protein envelope of the fat cells. There is thus recovered about 99.75 per cent of the oil present in the livers.

To appreciate the significance of the electrolytic method, it is said that the "sun-tried" livers yield only from 15 to 35 per cent of their oil content, and fully two-thirds of this is made up of the poorer oils. Where the cod-liver oil is extracted for medicinal purposes by steam-jacketed kettles or the water bath, it takes quite three gallons of livers to produce a single gallon of oil, and even so all of the oil is not fit for medication. By the Rogers-Bennett process, the oil recovered at any time is of a uniform standard—the grade varying only with the age of the livers. Age in this case means the time elapsing between the catching of the fish and the delivery of the livers for rendering. In common practice, the livers must be taken in hand within twenty-four hours after the fish have come from the water. On the other hand, a fine grade of oil, meeting in every way the requirements of the United States Pharmacopœia, has been produced by the Rogers-Bennett system from cod livers six days old, and excellent oils have also been obtained from livers four to six weeks old.

The only heat used in the cycle of the Rogers-Bennett process is employed to stimulate the easy flow of the macerated material through the electrolytic cells. To this end, exhaust steam fills the space around the "coils," and the maximum temperature is about 155 degrees Fahrenheit.

The discharge from the electrolytic unit has the character of an emulsion, and is carried to a rotary screen which diverts most of the solid material into a receiving tank while the oil and finer solid matter enter a weir tank where the sludge settles and the oil and water go on to the sepa-

(*Continued on page 440*)

Melting Gold Coin at New York Assay Office

AS we pass down Pine Street and see the low classical building which houses the Sub-Treasury, we see an inclined wooden path leading to a forbidding looking building whose iron bars suggest a modern jail, but once inside this building we are in Aladdin's cave and hundreds upon hundreds of billions of dollars are in evidence. This unpretentious entrance would in the normal course of events have been closed and sealed up and the new and beautiful façade and entrance on Wall Street would have been open if it had not been for the bomb outrage which is still so recent in the minds of all. The explosion took place directly in front of the Wall Street entrance of the Assay Office and there is little question that as an objective the Assay Office had equal honors with the Morgan bank across the street. The destructive bomb or series of bombs tore pieces out of the stone, destroyed all the windows and warped and deformed the iron grills and other ornamental work in the beautiful office which was to have been devoted to the use of the public. Fortunately, owing to delays of various kinds, there were practically no employes in the new section of the Assay Office, or the death toll, already large, would have been increased by fifty or sixty. It will take many months and a considerable sum of money, which, unfortunately, Congress must appropriate, before the signs of havoc can be eradicated. The old building is not an old building at all; in fact, it is only about ten years old, but is called the old building in contradistinction to the new building which, it is hoped, will be opened by July if Congress appropriates the necessary funds to repair the damage. The older building will be used exclusively for melting and refining, while the new building will be devoted to the assay laboratories, the public reception rooms for those who bring their gold to be assayed, executive offices and several floors of vaults which are so urgently needed. Our cover presents a most interesting phase of the work of the Assay Office—the melting of coins into gold bars.

During the war period hundreds of millions of dollars of foreign gold coin, principally British sovereigns, Japanese yen and French francs found their way to the melting pots of the United States Assay Office at New York. A difficult problem presented itself in the prompt melting and storing of this vast treasure.

Regulations governing the handling of these deposits were so modified as to work no injustice to the depositor. Payment of 99 per cent of the value of the deposit was made, ascertained by their being weighed immediately after receipt when presented in sums of $1,000,000 or over. Of course such deposits come only from banking houses of recognized standing and when advantage is taken of this regulation the depositor is required to give guaranty in writing of the integrity of the coin. With the old regulation of a 90 per cent advance after weighing, the interest loss to the depositor would be considerable in a transaction involving several millions of dollars. Another important change authorized, was the reporting by the assayer on deposits of not less than $5,000 to one-tenth of one-thousandth instead of one-quarter of one-thousandth.

The physical operations involved in the handling of these deposits are as follows: The coin, after removal from the sealed boxes in which it is shipped, is weighed to .01 ounce in drafts of approximately 2,300 troy ounces. The advance payment is made to the depositor after this weighing and is based on the fineness of the coin deposited.

Drafts are delivered to the melting room and are shoveled into graphite crucibles with long-handled scoops. Three drafts or approximately 7,000 troy ounces (480 pounds avoirdupois) constitutes a melt.

Melting is done under cover of charcoal (powdered) to prevent oxidation and the molten charge is dipped from the crucible and cast into bars weighing approximately 340 ounces each. Each bar is given the melt number and returned to the receiving room and weighed to determine the after-melting weight, upon which the final payment to the depositor is based. On new coin the average melting loss is .25 ounce per 1,000 pounds melted. After each third of the melt is poured a dip sample is taken for assay and this is checked by a chip taken from the first and last bar of the cast. The pictures on this page, as well as our cover drawing, represent stages in the assaying process.

The bars, known as certificate bars, are properly marked with weight, fineness and value and stored away in the vaults and gold certificates issued against them. We are indebted to the Hon. Verne M. Borie, Superintendent of the Assay Office, and Mr. E. J. Wager, the melter and refiner, for courtesies in connection with the present article.

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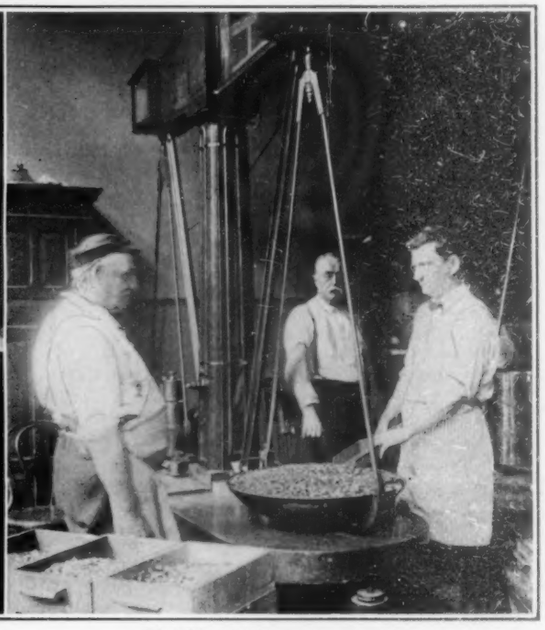
Pouring molten gold into iron molds



Weighing 2400 ounces of gold

A Non-Inflammable Timber

A PROCESS has been made public in England by which timber is made fire-proof. It consists in submitting the wood in a closed cylinder to a steaming and vacuum treatment, which removes the air and moisture in the pores of the wood and vaporizes the sap water. The wood is then impregnated under hydraulic pressure with a solution of fire-resisting chemicals, which replace the elements driven out by the preliminary treatment. Finally the water of the solution is dried off, and the chemicals in minute crystal form remain embedded in the fibers. The effect of this treatment is explained as being that on the application of heat the crystals expand and form a glossy coating, which excludes the oxygen of the air and prevents its combination with the wood, thus rendering flame an impossibility. The higher the temperature, the more the crystals expand, and though in time the chemical action of each crystal becomes exhausted and the wood becomes charred fresh crystals come into play, and though the wood may eventually be charred completely through, no flame will be generated. Wood treated in this way does not differ in appearance from wood that has not been treated, and it is claimed that it does not corrode nails or screws.

Can Snakes be Charmed with Music?

THERE is no foundation in fact for the common belief that a snake can be "charmed" with music, according to Allen S. Williams, director of the Reptile Study Society of America. Mr. Williams bases his opinion on a series of experiments extending over a period of nearly twenty-five years.

"I have tried every sort of music," says Mr. Williams, "from a tin whistle with note holes in it to a symphony orchestra, and have used as subjects nearly every variety of snake, but have yet to note any response on the part of the reptile.

"Once with a very beautiful panther snake, which because of his red robe we called Richelieu, I thought I saw signs of response, so I laid him on top of the piano while I played. He looked at me steadily for a moment and then slipped off the piano and started for a mouse hole which had once yielded him prey."

In another experiment, Mr. Williams surrounded a violinist with more than 200 snakes. He noted no response to the music from any of them. The belief that snakes are responsive to music probably originated, Mr. Williams believes, from the East Indian fakirs.

These men play on a peculiar reed whistle, swaying their bodies as they play. A snake, usually a hooded cobra, erects its head from a basket before the player and sways with the rhythm of the music. The explanation, Mr. Williams says, is not in the music but in the swaying of the musician's body.

"The vision of all snakes," he says, "is very defective. It has been said that the boa constrictor cannot see as far as his own length. I believe that is an exaggeration, but my own experiments have shown me that the snake sees very little of form or color. The thing which most attracts him is motion. I have seen snakes violently startled by the flapping of a window curtain.

"In the case of the Hindu fakir, the snake follows the motion of the man's body trying to see what is before it, either because it fears the thing might harm it or may prove to be something good to eat.

"I have obtained about the same result with other snakes, with and without music, but the hooded cobra makes an especially good subject for this trick because it has the habit of "sitting up" about one-third of its length.

"In fact the snake, if it had any emotions, would find them hard to express. A dog can wag his tail and actually laugh when he feels like it, but a snake cannot wink an eye for it has no eyelids. More intelligence is usually attributed to a snake, too, than it actually possesses. I believe it to have the least intelligence of the reptiles, both lizards and turtles being above it."

Another fallacy which Mr. Williams believes he has exploded is the belief even among some scientific men that human beings have a hereditary fear of snakes.

"I have never found a little child which was afraid of snakes," he says. "On the other hand children seem to like them. I have found, too, that women are less afraid of snakes than men."

The Service of the Chemist

A Department Devoted to Progress in the Field of Applied Chemistry

Conducted by H. E. HOWE, Chemical Engineer

The Electric Furnace in Metallurgy

ATTENTION is called to a reading list comprising some 87 pages of references on the Electric Furnace as Applied to Metallurgy. This is a contribution by C. J. West and has been reprinted from the transactions of the American Electro-Chemical Society, the paper having been presented before the April meeting of that society. The author has attempted to include all the important references since 1900, the date at which electric furnaces were becoming established in the wire and steel industry, and, beginning with 1907, references to Chemical Abstracts are given in addition to enable the reader to eliminate many of the references which might not fit his particular needs. Compilations of this character, involving as they do patient search and tedious examinations, are always valuable contributions and the information that such a list is available will be welcome.

Synthetic Ammonia

WHILE an attempt is being made to have legislation enacted to help establish a fixed nitrogen industry in America, primarily through the operation of Government plants, remarkable progress is being made abroad. According to the report of the American Chamber of Commerce in Berlin it appears that synthetic nitrates have been developed to the point where Germany is now entirely independent of Chile. By the Haber and cyanamide processes she will not only be able to supply her own requirements but expects to export fixed nitrogen in the near future.

In France the recent researches of Claude have caused quite a commotion, he having succeeded in producing pressures of more than 1,000 atmospheres by methods applicable to industrial uses. He has shown that it is not only possible but indeed easy to attain such pressures and has now applied them to the production of synthetic ammonia. Under the conditions which he obtains, hydrogen and nitrogen combine with such facility that a large output is possible with a comparatively small installation. In the Haber process approximately one-third of a gram of ammonia is produced per gram of catalyst, whereas Claude obtains a yield of ten grams.

De-tanning Chrome Leather

A BRITISH patent has recently been issued covering a process whereby scrap leather may be de-tanned and the resulting material used for the manufacture of glue and gelatine. The chrome leather is first immersed in a solution of an organic acid, such as phthallic, lactic, tartaric, oxalic, or other organic acids containing two or more hydroxyl groups. The chromium may be recovered from the resulting solution and the de-tanned material treated in the usual manner for making glue or other similar products.

The Fruit Fly

IN a recent number of the *Chemical Bulletin* David Klein comments upon a popular article in the *Scientific Monthly* for December, 1919, in which Dr. Loeb discusses the results of his experiments with the fruit fly, hatched and bred aseptically. One interesting finding is the duration of life appears to be a function of the temperature to which the fly is subjected. Thus at 30°C. its average life is 21.15 days; at 20°C., 54.3 days; while at 10°C. it is more than 177.5 days. As Dr. Klein observes, if temperature were a factor of equal importance in human life, one would be able to live a prolonged existence at the North Pole and but a brief period at the equator, thus giving him the choice between a long, monotonous existence and a short, merry one. We may find some time that life may be written as a chemical equation and that the sum total of the chemical energy of a life-time is a constant and the length of life dependent upon the rate of its utilization.

Industrial Alcohol

ATTENTION is called to an article in the March 17th issue of *Chemical and Metallurgical Engineering* on this subject by Burnell R. Tunison. This article treats of industrial alcohol under the new law and regulations, and in addition to defining the various types of alcohol, includes an interesting table of authorized formulas for specially denatured alcohol, and another table giving the products and industries authorized to use specially denatured alcohol. The extent to which industries now depend upon alcohol is indicated by the list of more than a hundred products of very diverse character. The alcohol situation is complicated by scarcity of raw materials, unusual demands and difficulties of transportation and marketing brought about by the difficulties attending the enforcement of prohibition legislation.

Paper Fibers

TWO promising new fibers for strong paper are reported—one consists of the macerated bark of the cuazuma tree, which occurs in Mexico, and the second the leaves of the doum tree, which grows along the coast of Morocco. The bark in question is sometime 20 to 30 centimeters in thickness and the fiber from it can be produced at a low cost. The doum is a dwarf palm that matures rapidly and the estimate is that 100,000 tons may be available annually. The pulp produces 75 per cent of fiber, which has a satisfactory felting power, great tenacity and suppleness.

Glue and Gelatine

AN Australian patent has recently been granted on a process to produce glue and gelatine from horns and bones, which are subjected to a solution of hydrochloric acid for a period of five days, the step being repeated until the material has been treated five times. After a thorough washing in cold water, the material undergoes two twenty-four-hour applications of a lime solution, after which it is washed again, dried, and boiled from twelve to eighteen hours. The thin liquid may then be skimmed off and dried and comprises pure gelatine, while the thick liquid contains the glue.

Pyroxylin

AN American patent has been granted on a process devised to decrease the inflammability of pyroxylin. Commercial pyroxylin is dissolved in methyl alcohol containing five per cent of acetol. The solution is then diluted with carbon tetrachloride and chlorinated in the presence of a carrier such as zinc or tin chloride, until five to eight per cent by weight of chlorine has been absorbed by the pyroxylin. The solvents may then be evaporated off and the chlorinated pyroxylin washed, neutralized and dried in the usual manner.

Aluminum from Labradorite

A PROCESS has recently been developed in Norway for the extraction of alumina from labradorite. The mineral is dissolved in dilute nitric acid made locally by the fixation of atmospheric nitrogen, and the impurities remain in the residue. Evaporation and heating to a point at which the aluminum nitrate left is decomposed, is carried on and the calcium and sodium nitrates are dissolved in water, leaving a pure aluminum oxide. Pure labradorite contains about 30 per cent alumina, which is equivalent to 16 per cent aluminum. It must be that this mineral as found in Norway differs from that occurring in America, as the labradorite usually found here is not sufficiently soluble in nitric acid to give promise of working the process on a commercial basis.

A New Abrasive

THERE has been need for some time for an abrasive having extreme sharpness, long life, uniformity and fast, cool-cutting ability. In addition it should be possible to form a wheel from this material that would be what is known as "open" and brittle in its structure. Research has at last provided such an abrasive, composed of large alumina crystals and the impurities present probably do not exceed 1.5 per cent, which is very much less than in the case of the ordinary type of aluminous abrasive. When a rupture occurs in such a large abrasive grain it means that a crystal of alumina has been actually fractured, the principal result being the provision of new sharp-cutting points and edges.

Cottonizing Vegetable Fibers

A PROCESS for cottonizing such fibers as jute, hemp, flax, and any vegetable fiber which has a woolly or hair-like feel, has been reported. The waste fibers are passed through a device which tears them apart; they are then crimped, but the process does not reduce the larger fibers to the point where other than coarse yarns can be spun. These fibers thus treated by a mechanical process are not so smooth as those produced by chemical treatment, but they produce greater strength largely on this account. The chemical process employs both sodium hydroxide and chlorine, as well as oil soaps and peroxides, which develop nascent oxygen. The dry fiber is washed in a way to force the fluid through the material and in order to make this treated fiber more suitable for spinning a strong, cold caustic soda solution is recommended, after which it is washed in hot water.

Chlorine and Influenza

DR. CHARLES BASKERVILLE, in speaking on this subject, points out that while the data thus far obtained do not warrant drawing conclusions, such facts as have been established would indicate to the medical man the advisability of trying experimentally dilute chlorinated air as a prophylactic in such epidemics as so-called influenza. Dr. Baskerville determined to what extent workers in plants where small amounts of chlorine were to be found in the atmosphere were affected seriously by influenza and many of those from whom information was requested expressed the opinion that chlorine workers are noticeably free from colds and other pneumatic diseases. One plant in which fifteen per cent of the employes were infected reported no cases in the chemical building, where chlorine was produced, nor did any occur among the employes in its bleaching room.

Light Alloys

IT is interesting to note that the majority of the light alloys in the United States are aluminum-copper, whereas abroad aluminum-zinc is more often found. This is said to be due to our lack of information regarding the aluminum-zinc series, and to supply the missing information, extensive research work has been undertaken on this class of materials by one of the large zinc-producing companies. The production of aluminum is rapidly increasing in the United States, and it is predicted that by 1930 the total production will equal, if indeed it does not exceed, that of copper. Aluminum as an element in die-casting has caused a number of difficulties, which are, however, being gradually overcome, and at present 150,000 castings can be made from a single die. There is no question but that aluminum has come to stay as an engineering material, the possibilities of which have by no means been exhausted.

Heating Wood Before Gluing

IN its Technical Notes the Forest Products Laboratory points out that in joints of small area, where the gluing is done in warm rooms in the absence of a draft and the wood itself is at room temperature, little is to be gained by pre-heating the wood. In fact, under such conditions, heating may be detrimental, since the glue will be kept thin and squeezes out when pressure is applied. However, when joints several inches each way are glued, pre-heating has a distinct advantage and unless heated, the joints develop their full strength only in spots. It has been found that joints of large size can be produced of uniform high strength if the wood is heated for from ten to fifteen minutes at from 120° to 130°F. just before gluing. The heat prevents the glue from chilling and keeps it liquid until pressure is applied. The rate of set is retarded, full joint strength being developed in ten hours in mahogany and more than twelve hours in red oak and maple, whereas cold-glued joints reach their full strength in less than eight hours.

Chemistry and Brazilian Imports

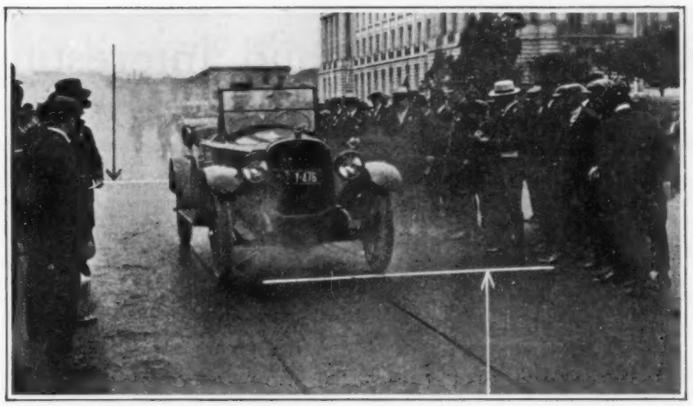
A LAW has been passed in Brazil providing for the establishment at once of laboratories at ten of the ports where all kinds of fabrics, chemical products, drugs, pharmaceutical preparations, canned meats, and fish and all products used as foods or in the preparation of foods and drink are to be tested. Later other laboratories are to be established in custom houses at other ports, and a fee of 2 per cent of the total import duties will be levied to cover the costs of making the analyses. The object is to prevent the introduction into Brazil of articles injurious to the public realth.

San Francisco's Traffic Convention and Street Safety Show

By C. W. Geiger

FOR the first time in the history of the United States a foreign government has "sat in" for the purpose of creating a common police law, for the United States and Canada. Both nations will be allied in framing this great and beneficial law that will enable the motorist to travel from the Atlantic to the Pacific Coast, either through the United States or through Canada, and meet with only one general condition everywhere, thereby relieving the motorist from the embarrassment and annoyances that he must now endure in extensive travel.

The primary purpose of the Third Annual Convention and Safety-First Exposition of the International-Traffic Officers' Association at San Francisco is to obtain an international viewpoint on traffic conditions and crystallize this viewpoint into a uniform Motor Vehicle Act to be presented to the various legislatures at their next sessions. The need for uniform traffic regulation is great, and universally known, so it is hoped that out of this conference and meeting of those who are thoroughly conversant with all traffic conditions, such uniform legislation will come. It must be so broad in scope that it will take care of the pedestrian as well as the motorist, and in such shape that it can and will be enforced to the benefit of the people, making our streets and highways safe for all users.



A test of braking power, in which the car going 20 miles per hour was brought to a standstill in six feet

Other notable features of the exhibit are the safety devices to guard the car against theft. These include locks for the steering wheel, which defy picking, and chain tire-locks.

In keeping with the traffic convention a splendid traffic regulator, on the order of the railway signal systems, was exhibited for use on city streets. It consists of a semaphore placed on posts at the intersection of streets, and provided with lights, bells and

(*Continued on page 440*)

The street in front of the Exposition Auditorium was turned into an outdoor laboratory for every sort of traffic test. The pavement was even hosed down by the fire department for the proper slipperiness for a skidding demonstration. One test arranged was to show the proper distance in which a car should stop in an emergency, the demonstrating cars turning a corner and pulling up short at various speeds. At a speed of 15 to 20 miles an hour a car was brought to a dead stop in six feet. For these tests the street was marked off with white paint, indicating to the driver where to start his stop.

A hundred or more automobile offenders got a novel warning when the traffic policemen in the down-town region of the city gave them formal printed admonitions to go take a look at the safety-first stunts, where there was displayed what is probably the largest and most complete exhibit of safety-first devices for automobile traffic ever shown in this country. Arm wig-wagging, judging from the exhibits, is already a thing of the past, superseded by the little arrow signals which are attached to the windshield, or by rear colored lights, or by work signals flashed to the accomplishment of a bell. The blinding glare of approaching headlights is dimmed by an adjustable violet glare-shield attached to the steering wheel; by violet-ray lenses; or by lenses supplied with a fin or shelf or specially treated glass which acts as a shield between the light and the eye of the approaching motorists. Prominent among the safety devices is a safety bumper which automatically stops the car and sounds a horn when it strikes another auto. This bumper promises to make safe the lives of little children caught unawares as it stops within a few feet when going at twenty miles an hour, and is too low to the ground to admit of anyone being dragged beneath it. Everything is done mechanically so as to leave the driver as free as possible to guide his car, and yet make it simple to meet the requirements of the motorists laws.

The auditorium in which the safety-first exhibition was held, showing a group of the exhibits

Something New in Gasoline-Driven Plowing Machines

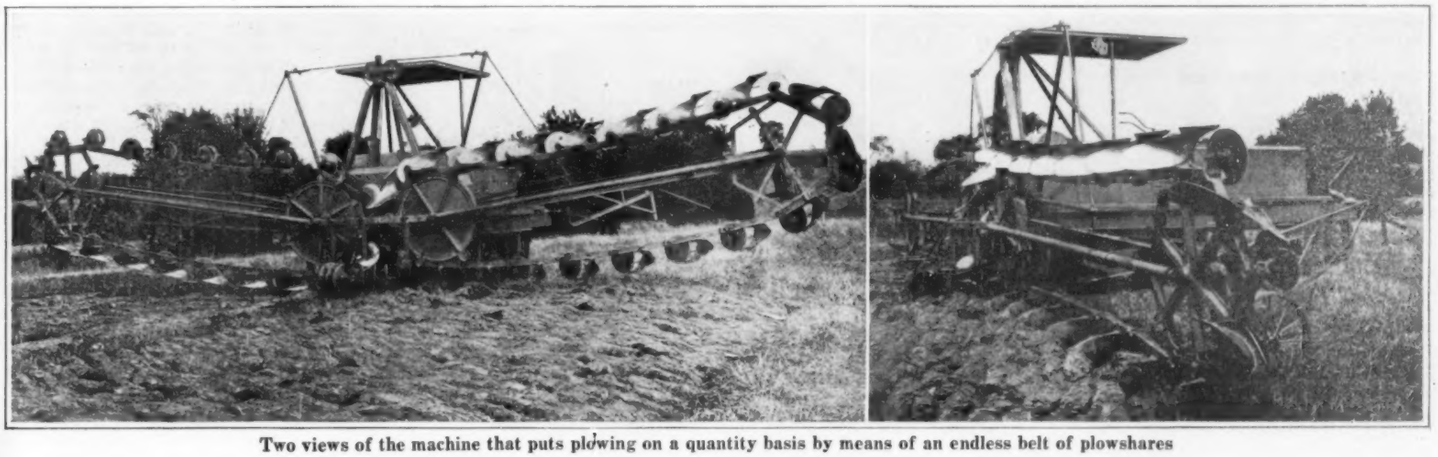
By James H. Rodgers

WE are told that there is nothing new under the sun. In a broad sense this is probably true, but variation in the application of certain well recognized principles frequently creates machines that may, without exaggeration, be properly classed as extremely original. Such is undoubtedly true of the plowing machine herewith described and illustrated. What, at a distance, appears to be some queer development of a flying machine, with its wings outstretched, resolves itself, at closer range, into an interesting but distinctive type of plowing machine.

To the person unfamiliar with mechanics, the initial sight of such a machine is somewhat astounding, but keener observation, particularly when the plow is in motion, impresses one with the vast possibilities of such a unique machine.

During the war, and since, the factor of man-power for agricultural purposes has been rather a serious problem. As a partial solution to this question the adoption of machinery capable of performing more work with less labor appeared to be the best means to the end sought.

The illustrations show several views of this new plowing machine, the design of which is out of the ordinary, and demonstrates a radical departure from the usual present day practice of tilling the soil. The designer of this machine, Mr. L. A. Desy, civil and mechanical engineer of Montreal, Quebec, has made several successful preliminary trials on a farm close to Montreal, and the initial performance has more than met the fullest expectations of the builder.



Two views of the machine that puts plowing on a quantity basis by means of an endless belt of plowshares

Unlike the ordinary plow, where the furrows are made parallel to the travel of the machine, the method of operation in this plow causes the plow shares to move at right angles to the forward movement of the tractor, resulting in a furrow that converges toward the center at an angle of about 20 degrees, leaving the plowed land with a herringbone appearance.

In operation, the plows travel toward the center of the machine, seven of the plows on each side being in the ground at one time. The width of the land covered at one passage of the machine is approximately 40 feet.

When turning at the end of a field the two plow arms can be raised so that the plow shears and the disks are clear of the ground, and the machine can be turned in its own length by means of the steering wheel and the caterpillar tractors. When desired, a start can be made from the very end of a field, as the tractor can be backed right up to a fence, if necessary. The machine, however, is intended for Western plowing, where large tracts of land are under cultivation.

The machine shown has an approximate weight of eight tons, and under tests on land that had not been plowed in several years, it covered about 30 acres in a day of ten hours.

Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

This simple tool twists a wire about a bag to tie it

Making a Twist of the Wrist Tie a Bag

WIRE for tying bags is being used to a large extent. So interest attaches to a special wire-tying tool that has lately been devised and that makes possible the tying of large numbers of bags during a working day. Wires are cut of sufficient length for a perfect tie and no material is wasted. A workman once taught the trick of the twist necessary to bend the wire, can fasten securely many more bags than when using twine.

Briquets from Coal

PUBLISHED reports say that the Lignite Utilization Board, which has been for months experimenting with the problem of cheaper fuel for domestic use from the low-grade coal found in southeastern Manitoba and Saskatchewan, has arrived at a satisfactory manufacture of briquets.

The chairman of the board has expressed the opinion that the engineers have succeeded in finding a system for the manufacture of briquets that will probably produce fuel equal to the best grade of the United States anthracite coal, and which will be even more satisfactory for domestic use.

The board has decided to erect an experimental plant with a capacity of 30,000 tons a year. The plant will doubtless be located near the mines operating in Saskatchewan, close to the Manitoba boundary.

The chairman of the board further says that a careful analysis of the costs leads to the belief that briquets can be manufactured and loaded on cars at the plant at about $7.50 a ton.

It appears that the Canadian Utilization Board entered upon its work over a year ago and was organized as a result of an agreement between the Dominion Government and provincial governments of Saskatchewan and Manitoba. The Dominion Government appropriated $200,000 and the provincial governments each $100,000 to meet the expenses of carrying on this work.

A transformer in the base of this night lamp reduces 110 volts to 6 volts

Use of Potato Flour in the Netherlands

AS a result of the continued high price of wheat flour it is announced that the Government of the Netherlands is arranging for the mixture of potato flour, manufactured in the Netherlands, with wheat flour from the United States to augment and cheapen the supply of breadstuffs in the country. It is announced that the Government has recently purchased from local manufacturers a stock of 20,000 metric tons of the potato product which it proposes to mix with the imported product. The potato flour bought by the Government costs 6.4 cents per pound as compared with practically the same price for wheat flour at the present time, but a somewhat higher price on an average for some time past. It is expected that by mixing the potato product with that of wheat any further rise in the cost of bread can be prevented, though it is understood that the fixing of a maximum price for bread will again be undertaken if that becomes necessary to prevent any serious rise in the cost of this staple food to the Netherlands people.

Both potato flour and potato starch have been used as constituents for bread during the war. There is considerable indisposition on the part of the Netherlands public to use flour containing the potato starch which, particularly during the war, was usually not of good quality, but it is anticipated that there will be no complaint as to the use of the potato flour which, when properly mixed with the wheat product, is said to make very good bread not much different from that in ordinary use in the land of dikes and canals.

A New Light That Costs Next to Nothing

BY the ingenious combination of a small step-down transformer and an automobile incandescent bulb, an inventor has recently introduced a night light which costs practically nothing to operate. Indeed, this light, operating on the standard alternating current supply lines, hardly affects the usual meter, hence the cost is negligible.

The principle of this new light, which is shown in the accompanying illustration, is merely the stepping down of the 110-volt alternating current to 6 volts in order to supply the necessary current to a 6-volt 2-candle-power bulb. The transformer is placed in the base of the porcelain body of the lamp. A bayonet type socket holds the lamp, which can be flashed on or off by the switch shown in our illustration. The hood of this attractive little lamp is so designed as to direct the light rays where they will not trouble the person making use of the lamp.

A New Use for Rubber Tubing

OF the many methods employed to keep the milk bottle clean and sanitary, the milk bottle top with rubber tubing run around the inside is one that should appeal to those of us who prefer their milk sanitary. It makes the bottle absolutely tight, and avoids the accumulation of dirt in inaccessible corners, since it can be removed for perfect sterilization.

The rubber tubing in this cap renders it sanitary

No longer is the scrubber obliged to get down on the knees or wring the mop with the bare hands when using this improved mop

Taking the Scrubber Off Her Knees

EVIDENTLY the inventor of the new mop depicted in the accompanying illustration became tired of having scrubbing done on the knees, and wringing the mop out by hand wringing. For with this mop the worker, through the use of an arrangement of gears and suitable handle, can wring the mop by turning a crank handle and scrub and dry the floor while standing in an upright position. The knitted mop head used is all in one piece and is easily removable when a new drying medium is needed. Once the mopping surface is placed against the floor, it lies perfectly flat and does not require a stooping position of the worker in order to secure this result.

New Cleaning Tool for Housekeepers

BEFORE this recently-patented cleaning device for brushes was available, either the hand was used to remove lint and hair from the revolving brushes in carpet sweepers and vacuum cleaners, or a metal comb. The work was highly disagreeable, to say the least. The present cleaner is like a cat's claw. It is strongly made and will remove the strongest accumulation of strings, hairs, etc. It is said to do its work without pulling out the bristles in the brushes.

Recent Patent Decisions

Defense on Intimidation.—This is an action for damages to plaintiff in his business of selling a varnish by reason of defendant's unfair competition. The plaintiff had manufactured and sold a varnish called "Varnish No. 25." It was manufactured by a secret process, was a varnish in its nature, composed of ingredients in such a way that it was free-flowing and reasonably quick-drying. It was commonly used to inject into tires of a bicycle to fill pores or small punctures in the rubber bicycle tires, and was manufactured by the plaintiff for that purpose.

The defendant by assignment became the owner of a combination patent issued to Chas. E. Duryea. This patent covered the use of a free-flowing gummy fluid within a pneumatic tire for sealing punctures. At the time of the purchase of the patent by the defendant, there were several compounds similar to that of the plaintiff being manufactured and sold in different parts of the country, and the defendant immediately began an active campaign to force the discontinuance of the manufacture and sale of them, claiming that its patent granted to it the exclusive right to use any liquid or powder inside a hollow pneumatic tire for the purpose of sealing punctures.

The failure of defendant, manufacturer of a fluid to seal punctures in pneumatic tires, to sue plaintiff, manufacturer of a like fluid, for infringement of patent, and defendant's publication of letters, circulars, and envelopes, which he used to threaten plaintiff's customers with suit if they continued to use plaintiff's fluid or varnish, held to be consistent with the good faith of defendant in the exercise of an intent to protect its business, thereby not warranting a jury in finding any malevolent motive to harm plaintiff in the destruction of his business rather than in legitimate endeavor to protect patent.—*Edwards v. Buff. Spec. Co. Supreme Judicial Court of Mass.*

This claw-like device enables one to clean the vacuum cleaner brush with ease

Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.

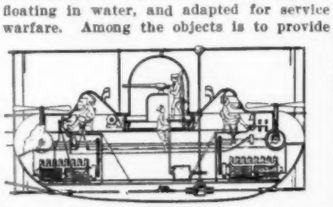
Pertaining to Apparel

NECKTIE.—A. M. BAKERMAN, 413 E. 138th St., New York, N. Y. The object of this invention is to provide a self-tied neck tie of the four-in-hand model, manufactured to resemble a tie as usually worn and tied on and around collars. A feature is to provide a tie in which all the parts are so arranged that the tie may be quickly adjusted into place and securely held in service position.

SWEATBAND FOR HATS.—J. C. PETERSON, 34 N. Gifford St., Elgin, Ill. The invention has for its object to provide a sweatband which can be adjusted to fit any ordinary hat, which will allow of circulation of air around the head, and which can be removed and replaced as desired. A feature is to provide a band of conical form conforming with the shape of the head and not with the shape of the hat as is customary.

Pertaining to Aviation

FLYING CRUISER.—N. G. COX, Livengood, Territory of Alaska. The invention relates more particularly to such flying machines as are suitable for use at times as vessels capable of floating in water, and adapted for service in warfare. Among the objects is to provide



A VERTICAL SECTION SHOWING THE VARIOUS MECHANISMS

extensible wings so arranged that they may be increased or diminished, or folded, and thus rendered inactive, and to provide afcilities rendering the vessel self-supporting, and to provide propellers so arranged that the axes thereof may be shifted to different angles relative to the hull of the vessel.

Electrical Devices

INDICATOR.—J. W. CARTER, JR., 5th and Pine Sts., Abilene, Texas. The object of the invention is to provide a device especially adapted for use on storage batteries, to indicate the date of the last watering, and that of the next, both in winter and in summer, and to indicate the date of charging, and whether full or partly charged, and so arranged that it may be locked to prevent accidental displacement or tampering.

ELECTROPLATING APPARATUS. — W. DIETZEL, Merrick, N. Y. The object of the invention is to provide a plating barrel whereby the operation is reduced to a minimum. Another object is to provide a barrel which may be charged from a number of different points without the adjustment of any parts and may be discharged by merely a reverse rotation. A further object is to provide a device so constructed as to hasten the plating operation.

Of Interest to Farmers

MARKER FOR PLANTERS.—O. H. KOHLHAAS, Calumet, Mich. The invention aims to provide a device particularly adapted to be used in connection with a planter, such as a corn planter, the marker being adapted to be operated substantially simultaneously with the seed dropping mechanism so as to subsequently indicate the location of the various hills. A further object is to provide an extremely simple mechanism which might be applied to any type of planter.

Of General Interest

FOUNTAIN PEN CLEANER.—C. W. GARVER c/o Western Union Telegraph Co., Ashland, Ohio. The invention has for its object the provision of a simple, inexpensive and efficient device of the character specified, in the form of a tubular casing of suitable material, adapted to receive in one end the pen supporting portion of a fountain pen, and to engage within the other the outlet of a water faucet.

DEVICE FOR TEACHING PENMANSHIP.—J. D. W. WILLIAMS, Tabor, N. C. The purpose of the invention is the provision of a simple and efficient device of the character specified which will exercise and train the muscles of the hand and arm in the formation of ovals. It is well known that the oval constitutes the fundamental figure in penmanship, with the pupil's muscles trained to accurately form such a figure a great stride has been made to writing legibly and rapidly.

LAWN EDGE TRIMMING GAGE.—J. LEES, 1705 W. Broad St., Bethlehem, Pa. The object of the invention is to provide a gage bar of metal construction, which can be pinned along the edge of a walk so that a cutting implement can be used in connection therewith in trimming off the turf in a smooth and even manner. A further object is to provide a gage which is adjustable so that at the edges of various widths can be trimmed and a cutting implement to be used in connection therewith.

WEATHER STRIP.—O. S. BRANHAM, 323 No. Virginia Ave., Roswell, N. M. The invention has for its object to provide a strip of the character specified, mounted to move laterally and longitudinally of a door and controlled by the opening and closing of the door for movement in such lateral and longitudinal directions, to tightly seal the space between the bottom of the door, and the sill when the door is closed.

LAMP BRACKET.—R. F. FERGUSON, 550 Waterloo St., Detroit, Mich. The invention has for its object to provide a simple and inexpensive bracket of the character specified, wherein a maximum of adjustment is permitted. In operation the lamp is arranged on an angle plate, the angle of which may be adjusted to vary the beam of light and after the parts are adjusted they may be securely locked.

FLOWER HOLDER.—MARY G. TILNEY, 935 Government St., Mobile, Ala. The invention provides a trough or water container with a wire mesh cover adapted to be sunk into the ground over a grave. Cut flowers are placed on the grave with their stems projecting through the mesh into the water in the container and are thereby kept from wilting.

CARD APPLIANCE.—H. MAIER, 1148 Hancock St., Brooklyn, N. Y. In order to assist cripples in the playing of card games the inventor has provided a device with which a one-armed man may shuffle and deal cards with the same facility as that of a normal man. The device is of very simple and inexpensive construction.

CLOTHESLINE HOOK.—H. C. LAFFERTY, 9528 116th St., Richmond Hill, N. Y. An object of this invention is to provide a clothesline hook which has a main supporting forked arm adapted to secure a clothesline thereto without the tying of knots. The device is provided with one or more auxiliary hooks to which several runs of clothesline may be attached.

FASTENING DEVICE FOR EAR ORNAMENTS.—H. T. MOLER, 1720 8th Ave. No. Birmingham, Ala. The invention is an improvement in fasteners for ear ornaments, and has for its object to provide a simple and efficient device for securing an ornament firmly in place on the ear in such a manner that it will cause no inconvenience. The device will follow the natural curve of the ear and may be easily detached when desired.

ADVERTISING DEVICE.—L. D. WHEATLEY, 564 E. Oak St., Portland, Ore. The device will simulate perpetual motion. A wheel is mounted between a pair of set screws carried by hollow standards. The point of one of the set screws is revolved by flexible shaft connection with a motor in the base of the mechanism. The other set screw is connected with the motor in such a way that when it is screwed back to remove the wheel the motor is stopped.

LIFTING DEVICE OF GRAPPLE.—M. CLOGSTON, 915 Harrison Ave., Terre Haute, Ind. The present invention provides a grappling means for effectively engaging with boxes, crates, cases and the like, which will be readily releasable when pressure is released so as to avoid the necessity of special tools for knocking the grapple free. The engaging elements may be readily detached for sharpening or substitution.

PROCESS OF PREVENTING THE INNER WALLS OF RUBBER HOSE FROM STICKING DURING MANUFACTURE.—F. C. MORSE, Canton, Ohio. A process is herein provided by which the uncured core or tube after being formed and before being braded may be economically treated so that it may be left for any length of time without any danger of the inner walls of the tube sticking together, should the tube become compressed for any reason.

FEED BOX.—R. R. STICKLER, R.F.D. No. 1, Wausau, Wisc. The invention provides an improved feed box for feeding cattle, which is attached to the stanchion by a system of levers which permit of swinging the feed box out of reach of the cow when not in use and of swinging it into position in front of the cow when the cow is to be fed.

GEOMETRIC FIGURE.—E. T. MILLER, San Antonio, Tex. A new geometric figure is provided for plotting and delineating a pattern for a covering for balls. The coverings are so formed as to require a minumum length of closure, thus lessening the amount of sewing necessary for the complete closure of the covering over the ball.

TOOTHPICK DISPENSING DEVICE.—C. H. BENNETT, 107 Chapel St., Mount Morris, N. Y. An object of the invention is to provide a sanitary device which will prevent the handling of the toothpicks and present one at each operation. A further object is to provide means for operating a cylindrical toothpick receptacle having a gripper thereon which is movable into the receptacle to grip a toothpick and convey the same to a position outside of the receptacle at each operation of the device.

ARTIFICIAL LIMB LOCK.—L. E. HULLINGER, 255 Bergen St., Brooklyn, N. Y. An object of the invention is to provide a lock for an artificial arm, by means of which the lower arm may be locked in any number of positions with respect to the upper arm. The invention aims to provide such a device by means of which the wearer may be capable of performing certain functions in a far more simple manner than has been the practice heretofore.

COAT HANGER.—J. L. WEBER, 407 S. Clinton St., Chicago, Ill. Among the objects of the invention is to provide a coat hanger which can be readily adjusted to be suitable for coats of different sizes, which can be folded to permit of its being carried in a pocket and which is simple and durable in construction, light in weight and can be manufactured cheaply.

FLEXIBLE CONNECTION.—R. STAR, 253 Bergen St., Brooklyn, N. Y. The invention relates to hose pipe connections. Among the principal objects are to avoid breaking extensible members forming flexible connections between relatively rigid devices, to provide a tabular member freely extensible without danger of rupture or damage to the structure, and to simplify and reduce the cost of manufacture of the connection.

CONDIMENT HOLDER.—P. P. DEAGUIAR, 156 Water St., New York, N. Y. The invention relates more particularly to salt shakers, an object being the protection of the salt from moisture so that it will not become lumpy or moist and can be readily shaken from the holder. A further object is to provide a holder which will be entirely sanitary, comparatively cheap to manufacture, and neat and attractive in appearance.

FOLDING CAMP BERTH.—W. F. MOODY, 6 Boston Bldg., Denver, Colo. The object of this inveition is to provide a knock-down structure which can be packed in relatively small space and which can be quickly assembled to form a portable double-deck berth providing four cots or beds in a single unit, and which is capable of assemblage of units in any desired number.

CARRIER FOR EXPLOSIVES.—C. A. COTTLE, 25 Church St., Edwardsville, Pa. The object of the invention is to provide a carrier adapted to receive a number of sticks of explosive. The device comprises a cylindrical casing including a body closed at one end and open at the other, a cover telescopically engaging over the open end, staples carried by the body to receive a strap handle, and a hasp engaging one of the staples to provide for a padlock or fastening at the opening end.

TORPEDO TRAP.—V. H. MASTERS and M. G. SHOOP, 315 N. French Ave., Sioux Falls, So. Dak. The invention has for its object to provide a trap wherein upper and lower sections, the free end of the lower section being buoyed to cause it to rise to the surface when unrestrained and being normally held below the surface by a counterweight, the sections supporting between them a net for engagement by the torpedo, the net being connected to mechanism for releasing the counterweight when the net is struck to cause the trap to lift the propeller of the torpedo out of the water.

AUTOMATICALLY OPERATED SUPPORT.—S. E. SUDBURY, 703 E. 6th St., S., Salt Lake City, Utah. The invention relates more particularly to an automatically operated support for use in connection with furniture and cabinet work. An object is to provide a pivoted support having a slot for the passage of a pin, the pivoted and slotted support including a swith head having an automatically operating switch for controlling the movement of the pin in closing a lid or similar device.

ADVERTISING ATTACHMENT FOR SCALES.—A. N. FUNJ, c/o Auto Advt. Weighing Machine Co., Houston, Texas. The invention has for its object to provide an attachment of the character specified, wherein a series of display members are provided, mounted to be moved into different positions, to bring different matter into display position and controlled to movement by the stepping onto the weighing platform of the person to be weighed.

HAIR FRINGE.—M. MULLER, address Wm. Kaufman, 1482 Broadway, New York, N. Y. The object of this invention is to provide a hair fringe adapted to be worn over the user's hair at the back of the head to provide a bobtail effect without requiring bobbing of the natural hair. Among the objects is to permit of quickly and securely fastening the hair fringe in position on the head or removing it when desired.

ORNAMENTAL ROPE.—C. A. REED, Williamsport, Pa. The invention relates to fringed ropes or strings adapted to be used for ornamental purposes, the object being to provide a rope of this character of simple and efficient construction. The several strips comprising the rope may be of variegated colors so that an ornamental effect is produced.

PENCIL.—W. K. HOLMES, 409 Pearl St., Brooklyn, N. Y. This invention relates to a pencil in which the lead is projected from a barrel by relative rotation of the pencil parts. A feature of the invention is that while the lead is projected by the relative rotation, it is not retracted thereby, but is provided with a yielding holder and upon the withdrawal of the projecting parts the lead must be pushed in against the pressure of the yielding lead holding means.

SILL CONSTRUCTION.—F. N. MARVICK, 608 W. 5th Ave., Pine Bluff, Ark. The invention has for its object to provide a construction of the character specified wherein the heavy wooden sill generally used is replaced by a plurality of pieces of relatively small cross sections, thus permitting heart pieces to be used, and a perfect insulation against dampness provided.

COMBINATION CLOSET SEAT AND BIDET.—DE FOREST L. RATHBONE, Box 1020, Jacksonville, Fla. The object of the invention is to provide a device capable of use in the ordinary manner as a seat and having a bidet or douch fixture in connection therewith, connected, with the water supply and normally in inoperative position, and concealed by the seat but capable of being brought into operative position when desired.

SHOE HEEL.—E. S. HELWITZ, 1443 E. 9th St., Brooklyn, N. Y. The object of the invention is to construct an elastic pad for "French" heels in a very durable and economical form, and to make it attachable to the leather heel without the use of screws, tacks or other devices, and so constructed that the pad may be removed or attached readily and will not become a necessarily unseparable part of the shoe.

CHART HOLDER.—C. W. BABCOCK, 221 Harvard St., Brookline, Mass. The invention relates to means for supporting charts and map holders to be used aboard ships. The object is to provide a holder which will be easily adjusted to fit various lengths of charts or maps, and to support and hold them in taut condition, a chart holder frame being provided to expose the charts to view during navigation.

SCREENING OR FILTERING APPARATUS.—H. D. WELLS, 35½ Grant Ave., Glens Falls, N. Y. The object is to provide a screening or filtering apparatus designed for use as a pulp thickener or as a pulp washer or as a water filter. Another object is to

RECENTLY PATENTED INVENTIONS

provide an apparatus which has a large capacity, requires little or no labor attendants, avoids loss of pulp and reduces cost of wear and labor to a minimum.

COMBINATION HEEL.—F. J. McEwan, 531 N. Lawler Ave., Chicago, Ill. Among the objects of the invention is to provide a combination heel which has greater resiliency and durability than a solid rubber heel, which may be adapted to shoes of various sizes, and which will not slip on a wet surface, or be noiseless in a manner objectionable to many persons.

HYDRAULIC JOINT CARTRIDGE.—E. Rimailho, 98 Rue de la Victoire, Paris, France. The present invention has for its object an arrangement of removable joints, the organization of which is designed in view of insuring the easy replacing of the same whatever may be its apparent complexity. For this purpose all the organs of the removable joint are assembled upon a sanie mounting which is previously located into a mounting tube in which the joint is definitely adjusted for the use to which it is intended.

ROAD TRAIN.—E. Rimailho, 98 Rue de la Victoire, Paris, France. This invention relates to a road train formed by an automobile set comprising a transporting vehicle, the load transported by which produces the energy necessary for the transporting vehicle The set may be applied to the transport of all burdens, especially of vehicles, and in particular of ammunition and ordnance vehicles in the form of caterpillars.

PRINTING MACHINE HAVING AN OSCILLATING IMPRESSION CYLINDER. — C. Winkler, Berne, Switzerland. The invention relates to a system of tapes for holding the sheets during both the printing operation and the subsequent delivery of the sheets to the leading out device. By this invention the back edge of the sheet during the backward oscillation of the impression cylinder is prevented from leaving the cylinder before the proper time, thus, a good delivery of the sheet is assured.

COLLAPSIBLE BOX.—L. S. Lundy, Niagara Falls, Ontario, Canada. The invention relates to boxes made of cardboard, corrugated paper board, or suitable material. The object is to produce a collapsible box so constructed that it may be opened to remove its contents without destroying its usefulness, as a sealed container, and whereby it may be used a plurality of times, thus effecting a considerable saving.

REFLEX FOCAL PLANE CAMERA.—M. B. Boyce, 2 5th Ave., Haverhill, Mass. This invention relates to cameras of the automatic reflex focal plane type. A specific object is the provision of a camera having a moving picture lens and an adjusted moving picture shutter in combination with means for releasing the shutter, which latter is motor driven by a spring, the tension of which can be adjusted as desired. The camera is designed for moving picture films which will permit of enlargements with highly satisfactory results.

CANNING FOOD PRODUCTS.—J. F. Tronconi, Calle Maipu 871, Buenos Aires, Argentina. The invention relates to the method of canning food products, including meat as a main ingredient. The process consists in providing a can or container with a lining of gut in its interior, in such a way that after introducing the product, the latter will be entirely wrapped in the lining of gut, thereby preventing a direct contact with the can and providing at the same time a means for extracting the contents as an entirely wrapped block.

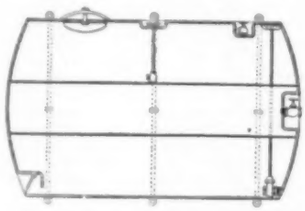
SHOE FASTENER.—P. Ferris, address E. A. Ferris, Westwood, Cal. This invention has for its object to provide a shoe with a series of independently operated fastening devices which can be conveniently attached or replaced when worn or broken and which will permit the shoe to be secured around the ankle and foot to conform to the shape thereof by reason of the fact that the individual fastenings can be adjusted so that they may be of varying lengths at different points on the shoe.

POST AND SIDE BAR OF BEDS, FURNITURE AND THE LIKE.—B. S. Gamble, West Perth, West Australia, Australia. The purpose of the invention is to form a joint or connection between the upright or leg and the side bar of a bedstead or other article of furniture or fitting in connection with like purposes. The invention is in the form of a steel bracket and plates and may be applied to articles of various material although especially applicable to wooden bedsteads and other wooden furniture

DRIER.—G. L. Spencer, Riverbank Court, Cambridge, Mass. The invention aims to provide a device by which an operator shall be enabled rapidly to determine the amount of moisture in laboratory tests of various substances, particularly raw sugar. A further object is the provision of an oven which will enable the analyst to make rapid control tests in factory work, and in laboratories generally.

CANDY WRAPPER.—W. S. Stoner, 90 West St., New York, N. Y. The object of the invention is to provide a wrapper which will not only act as a protection for the candy but at the same time so construct the same as to offer unusual inducements to the purchaser in that aside from purchasing the candy they are in reality purchasing, a paper doll which may be used as a source of amusement after the candy has been removed the wrapper still retaining its doll characteristics.

SALVAGING APPARATUS.—C. Sanger Bay St. Louis, Miss. The invention relates to the salvaging of sunken vessels and the like. The prime object is to provide a tank capable of being submerged by filling the same with



A LONGITUDINAL SECTIONAL VIEW OF THE TANK

water which is subsequently discharged from the tank to render it buoyant. A further object is to so construct the tank that it contains suitable means for discharging the water and means for controlling the discharge.

THREAD CUTTER.—Helen. S. Carson, Hyde Park Hotel, Chicago, Ill. An object of this invention is to provide a thread cutter attachable to a sewing thimble, which is so small that it will in no way interfere with the functions of the thimble, and still have the cutting edges so effectively arranged that the thread can be readily caught and cut by a stroke to the right or left.

SYRINGE.—O. O. R. Schwidetzky, Hasbrouck Heights, N. J. Among the objects of the invention is to provide a syringe consisting of a glass barrel and a rubber bulb, arranged to permit of securely fastening the bulb to the barrel and to prevent the liquid drawn into the barrel from flowing into the bulb on inclining the syringe with the nozzle upward, the wall of the barrel having a minute air passage preventing the passage of the liquid.

ANIMAL TRAP.—E. E. Rodgers, A. W. Wenger and C. M. Rodgers, c/o A. W. Wenger, Bitem Bate Co., Warsaw, Ind. Among the objects of the invention are to provide a simple form of animal trap having one or more openings, which may be easily set without the danger of accidental release and the catching of the fingers, yet may be readily sprung, thereby insuring the successful operation of the device. The bait is so placed that it is independent of the trigger or releaser.

VENDING DEVICE.—A. B. Simon, 3636 Douglas Blvd., Chicago, Ill. An object of the invention is to provide a vending device in which packages or containers of different sizes may be used and in which an economy of space is effected so that the capacity of a vending machine of good dimensions is materially increased over the ordinary vending device. To prevent tampering the device may be locked by a concealed lock.

THREAD CUTTER.—L. G. Fritz and A. A. Herzberger, 385 E. Perry St., Tiffin, Ohio. This invention has for its object to provide a device preferably mounted upon a finger ring and having means for cutting thread, cord or the like, so held that there is no possibility of injury to the wearer, and having means for guiding the thread into the cutter.

FOUNTAIN PEN FILLING DEVICE.—A. T. Cross, Box 352, Wickford, R. I. The invention relates generally to fluid dispensing apparatus and more particularly to a simple form of hand-controlled dispensing arrangement to be applied to bottles. While the invention is capable of more or less general application, it is especially designed for the filling of fountain pens; it permits of manipulation with but one hand, while the other hand holds the fountain pen or other device to be filled.

STEMLESS SELF-CLOSING VALVE FOR HIGH PRESSURE TANKS.—E. E. Garland, 7 Anderson Ave., Port Richmond, S. I., N. Y. The particular object of the invention is to provide a stemless automatically self-closing valve for use in connection with high pressure gas tanks. Another object is to provide a valve which is of simple and rugged construction having few parts, and these conveniently arranged to permit of the removal or replacement of the safety means without interfering with the adjustment or setting of the other valve parts.

CRATE.—W. D. Woodruff, Belton, Texas. An object of the invention is to provide a crate especially adapted for carrying fruit, as for instance, peaches, tomatoes, berries and the like and for retaining said fruit in perfect condition without bruising or mashing, and may be stacked one upon the other without danger of collapsing.

METHOD AND APPARATUS FOR MOLDING OR CASTING ARTICLES OR INGOTS FROM MOLTEN METAL.—E. C. Wills, Box 163, Rahway, N. J. The invention has for its object to provide a method and apparatus for subjecting the cast articles while in a plastic state and in the mold to heavy pressure, for thoroughly compressing the molten metal in the mold to eliminate defects due to unequal expansion or contraction or from any other cause.

STILT.—R. J. Lynch, 84 Hunter St., Tamaqua, Pa. The invention relates to adjustable stilts and has particular reference to a step or foot support stamped or cut from a piece of sheet metal and adapted to be associated with a standard in such manner as to permit the ready vertical adjustment thereon and its positive securement in its adjusted position.

METHOD AND APPARATUS FOR SINKING PILING.—E. F. Estes, 1315 E. St., Lincoln, Neb. The invention contemplates a movable device for use in the hydraulic sinking of piling, and in the course of which operation the ries to be overcome a side pressure of the surrounding earth against the sides of the piling, that may be likened in part to that occurring in the excavation of a well when a cave-in is threatened.

PROCESS OF MAKING MONOLITHIC PAVEMENTS. — A. J. Parrish, Paris, Ill. The purpose of the invention is to provide a monolithic construction in which a base of concrete is provided, the bricks being set in the plastic concrete and pressed and then the spaces between the bricks filled with cement filler so that when the cement and concrete harden the whole forms a rigid structure not liable to disintegrate as in the case of a construction with sand cushions.

POLISHING WHEEL.—R. W. Putnam, c/o Cooley Wright Mfg. Co., Waterbury, Vt. The invention relates to wheels commonly known as ironing wheels, an object being to provide an arrangement of scroll on the under surface of the wheel which prevents the accumulation of abrasive or other material used for grinding or polishing the surface of stone, always tending to move such abrasive material toward the center of the wheel.

FIREARM.—O. F. Mossberg, 273 State St., New Haven, Conn. The general object of the invention is to provide a small firearm or pistol, and more porticularly a firearm in which the barrel with plural bores is stationary in the firing operation while the firing pin is revolved and its firing member, which is off the center of the pin, is caused to contact with the successive cartridges.

MOVING PICTURE THEATER.—E. W. Van Fleet, 622 Con. Realty Bldg., Los Angeles, Cal. An object of the invention is to eliminate the seats in proximity to the screen, which are undesirable on account of distortion and disorder induced in the optic nerve. The arrangement does not diminish the seating capacity of the house; the chairs are separated by a low partition placed transversely between two screens, one at each end of the theater, the patrons being seated facing the screen farthest from them, and therefore not less than half-way back in the house from the screen which they face.

COTTON GIN.—O. C. McBride, 215 E. Pierce St., Mangum, Okla. An important object of the invention is to provie a lint flue wich means adapted to automatically operate to discharge the cotton from the lint flue when the pressure therein becomes excessive by reason of the cotton clogging in the lint flue due to the improper action of the condenser or to other causes. The device will not necessitate any special construction of gin or condenser.

COMBINATION TALKING AND MOVING PICTURE MCHINE.—P. T. L. Champeix, Menton, France. The invention relates to apparatus for presenting animated pictures formed by sections of an illustrated band or bands. An object is to provide a simple, efficient and inexpensive apparatus which can be easily synchronized with a phonograph through the medium of mechanical means which control the movement of the sections of the band forming the picture.

EXCAVATOR.—J. J. Warren, Genl Delivery, Seattle, Wash. The object of the invention is to provide a simple and efficient excavating machine by means of which tunnels, trenches, ditches and the like may be rapidly dug with small expense of power, and the minimum of operators or workmen. A further object is to provide an excavator which can be easily handled, which is self-driven, and in which a single prime mover is used both for the operation of the excavator and its travel and maneuvering.

RECORD FILING CABINET.—R. McCart, Jr., 221 Mills Bldg., El Paso, Texas. This invention aims to provide a filing cabinet which at all times will present all of the records contained therein in plain view and in such manner that the title, which may be pasted or otherwise applied to the individual record container, may be read without stooping. A further object is to provide a filing device which will accommodate records of different sizes.

LABEL.—R. A. Van Clief, 190 Summer St., Buffalo, N. Y. A particular aim of the invention is to provide a poison label for bottles or other containers, the object being to provide a label constructed with luminous letters which can be readily distinguished at night, and by this means obviate accidents, such as are caused by persons in the dark. The label can be attached to any bottle, and is so constructed that the luminous paint is entirely protected from the air and will retain its luminous qualities.

ADJUSTABLE COMPASS DIAL.—H. T. Zeiner-Henriksen, Framnaesveien 12, Christiania, Norway. The invention has for its object an adjustable compass dial comprising two transparent disks rotably connected with each other, one of the disks being provided with a complete set of points, while the other disk is provided with a rectangular cross adapted to indicate the four main directions of the compass.

GUN CARRIAGE.—E. Rimailho, 12 Rue de la Rochefoucauld, Paris, France. The inventor has been granted two patents of a similar nature, the inventions having special reference to a gun carriage forming a complete artillery unit so constructed as to permit of traveling over all sorts of ground owing to its large bearing surface on the soil. It is particularly valuable on light or wet soil. The gun carriage consists essentially of a chassis, having supports for the trunnions of the cradle of the gun and provided with rollers which roll over the chains actuated by driving wheels moved by an electric motor located on the carriage itself and fed by electric current furnished by a dynamo driven by a motor also located on the carriage.

READING GLASS HOLDER.—J. T. Spradling, White Plains, N. Y. The primary object of the invention is to provide a reading glass holder for use in connection with typesetting machines for the purpose of more clearly bringing out the manuscript of the copy from which the operator is working. A further object is to construct the device in such a manner that the glass is movable with respect to the manuscript copy, and is automatically returned to its starting point.

AGITATING DEVICE.—P. G. Campbell, Monolith, Cal. The primary object of the invention is to provide an agitating device to be used as a kicthen utensil for sifting flour and the like, by which better results may be realized in preparing flour for bread-making, particularly when the device is employed for mixing baking powder with the flour.

Hardware and Tools

INSULATED TOOL.—J. A. Weaver, 238 So. Patterson Park Ave., Baltimore, Md. This tool is provided with a movable insulating sleeve carried by the contacting portion of blade of the tool which completely covers the blade in a manner to prevent injury to the operator, while at the same time it enables the tool to be properly used in fulfilling its function.

PUNCHING SHEARS.—E. E. Cornell, 2714 Rutger St., St. Louis, Mo. The object of Mr. Cornell's invention is to provide a simple economical and effective hand-operated implement for slotting paper, card board, sheet metal and the like. The implement has a shearing action and is capable of ready adjustment in respect to the length of the slot to be cut.

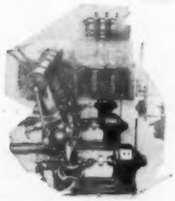
CASEMENT ADJUSTER.—C. J. Hagstrom, Maple Ave., Glen Cove, N. Y. This casement adjuster is readily adaptable to any casement

(Continued on page 436)

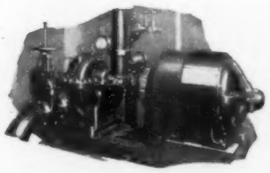
The margin of profit in many industries largely depends upon the efficiency, dependability, and low upkeep cost of machinery used

G E Vertical Pump Motors give powerful, efficient service in this water pumping station.

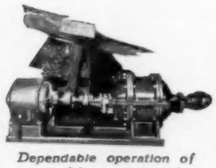
Vertical Motor direct drive for centrifugals or pumps.



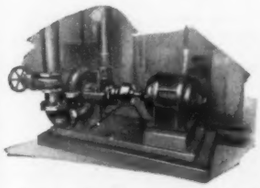
Motors direct connected to centrifugal pump—6000 gallons of water per minute.



Protect your industry with motor-driven fire pumps.



Dependable operation of motor-driven pump under severe conditions in mining.



Motor driving battery supply pump in sugar mill.

Widespread developments in irrigation through use of motor-driven pumps.

Electrically driven pumps raise the margin

PUMPING costs receive careful scrutiny in the economical management of many industrial properties. Consideration of the most satisfactory solution of the varied problems involved leads to electric drive in which G-E Motors and attending equipment are specified.

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Sales Offices in all large cities

43-504

RECENTLY PATENTED INVENTIONS

(Continued from page 434)

window, door, or other swinging object and is arranged to hold the window or door frictionally, but substantially, at any desired adjustment with respect to the wall.

EDGE TRIMMER.—W. H. BROWNING, 16 Cooper Sq., New York, N. Y. The invention relates to garden tools; an object is to provide a device which can be operated along the edge of a walk or around the edge of a flower bed or the like to cut the grass which hangs over or is pressed down by the mower in cutting the lawn.

LOCKING DEVICE.—G. W. BURTON, 1471 Broad St., Providence, R. I. The invention has reference more particularly to a locking device which embodies some of the characteristics of a nut lock, although its salient features are in no way represented by a nut lock except that the device is intended to be associated with a bolt or spindle which is threaded at one end, and in which such threaded end is received by the lock device, with the device confining and locking a structure on the bolt or spindle.

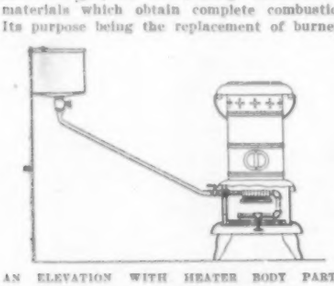
EXPANSION REAMER.—S. H. HUMPHREY and F. H. KORFF, 48 Academy St., Poughkeepsie, N. Y. The invention relates more specifically to means for permitting the convenient and ready adjustment of reamer blades. One of the objects is to provide an adjusting means which is inexpensive to manufacture, simple and rugged in construction and so constructed and arranged as to be readily adjusted to obtain a definite adjustment of the cutting edges of the tool.

MICROMETER GAGE.—T. SHAW, Woonsocket, R. I. This invention relates to measuring instruments, and has for its object the provision of a micrometer gage embodying in its construction indicating wheels moved by rotary movement of the handle and carrying indicia visible through sight openings, these indicia indicating the dimension of an object being measured directly and without the troublesome use of a vernier scale.

ADJUSTABLE CUTTER.—F. H. KORFF and S. H. HUMPHREY, 48 Academy St., Poughkeepsie, N. Y. Among the objects of this invention is to provide an adjustable cutter which is simple and strong in construction, inexpensive to manufacture and which is so constructed as to be conveniently adjusted to different predetermined sizes. A further object is to provide a micrometer adjustable cutter having indicating marks thereon so that the effective cutting edges of the tool may be adjusted to a predetermined size.

Heating and Lighting

OIL BURNING HEATER.—D. SEINIGER, c/o Standard Kertogas Co., Middletown, N. Y. The object of the invention is the vaporizing of kerosene into gas, the device being constructed of materials which obtain complete combustion. Its purpose being the replacement of burners,



AN ELEVATION WITH HEATER BODY PARTLY BROKEN AWAY, AND IN SECTION

using oil, gasoline, distillate or gas, for producing heat, power or steam, and its application is to heater bodies, such as room heaters, water heaters, cooking ranges, small hot water boilers and machines requiring gas or steam.

DEVICE FOR CONSERVING FUEL.—W. O. WOOD, Riverside, R. I. The invention relates to a device for employing the heat contained in the flue gases of stoves, furnaces and boilers. An object is to utilize air heated by the flue gases for heating purposes. A further object is to use the heat contained in the flue gases to pre-heat air supplied to the grate of the heating unit.

INDEPENDENTLY DETACHABLE UNDERSHADE FOR LIGHT STANDARDS.—M. Y. SUGIMURA, 32 Union Sq., New York, N. Y. An object of the invention is to provide an under lamp shade which serves as an indirect light reflector and also softens the direct downward glare from the source of illumination positioned above, and to permit such a shade to be independently removed without disturbing the assembly of the lighting fixtures.

HEATING MEANS.—W. W. LILLARD, c/o E. J. King, 141 Howard Terrace, Leonard, N. J. The object of the invention is to provide a heating means for heating monolithic structures such as street gutters and sidewalks, to melt the snow, and thus rendering it serviceable for heating floors of factories, schools or other buildings. The heatig medium can also be used in incubators and brooders, and can also form individual portabe heaters for use as bed warmers, foot warmers and the like.

OIL BURNER.—A. T. TIMOSCI, 668 Willis Ave., N. E., San Jose, Cal. This invention relates to oil burners, and has for its object to provide a small and efficient burner of the character specified, wherein the oil is sprayed on to a heated plate by means of fluid under pressure acting in the manner of an injector.

Machines and Mechanical Devices

CUTTER HEAD.—F. P. MILLER, c/o McCroskey Reamer Co., Meadville, Pa. The invention relates to cutter heads such as are used in milling machines; its object is to provide cutter heads whereby the cutting tool is firmly drawn into position in its seat and is securely fastened therein without the use of set screws or similar devices. Another object is to permit of quickly fastening the cutter in place and to allow of removing it whenever desirable.

PIPE PULLER.—S. ROBICHAUX and C. PAGGI, 3303 Montrose Blvd., Houston, Texas. This invention provides an improvement in pipe pullers and has for its object the provision of mechanism for use in connection with the pulling mechanism for pipe casings of wells of the character described in a previous patent (No. 1,280,850) granted to the same inventors. The present mechanism is used for gripping the pipe and threading or cutting the same as it is pulled.

MACHINE FOR BURNING IN BEARINGS AND LIMBERING UP MOTORS.—A. O. WHITE, High Point, N. C. The general object is to provide a machine for burning in bearings and limbering up motors and more particularly to an arrangement for rotating the crank shafts of automobile motors. A further object is the provision of an arrangement adapted alike to motor blocks removed from their supports, as well as to the crank shafts of automobiles complete and ready for operation.

SHEET GUIDE FOR FOLDING MACHINES.—E. SCHEICK, 17 Trinity Place, Arlington, N. J. The invention relates generally to a feeding device for folding machines and is particularly adapted for use in feeding relatively long and narrow strips of paper, to the folding rolls, on what is known as the Cleveland folding machine, but can be used in other machies employing a sheet feed mechanism and where an accurate fold is desired.

ROLLER BEARING AND METHOD OF MAKING THE SAME.—H. J. JONES, 72 Floyd St., Belleville, N. J. This invention relates to the construction of roller bearings as distinguished from ball bearings, and has particular reference to the form and method of making the rollers constituting the anti-friction elements of such bearings. Among the specific objects is to provide a roller in which the grain or fiber of the metal extends as nearly as possible parallel to the direction of rolling action, whereby the likelihood of chipping, flaking, or crushing of the rollers will be reduced to a minimum.

TUMBLING APPARATUS FOR FURS.—B. & S. FRIEDMAN, 232 Keap St., Brooklyn, N. Y. The object is to provide a tumbling apparatus for softening furs or pelts, arranged to insure an intense tumbling action with a view to quickly soften a large number of furs simultaneously and without danger of injuring the furs. Another object is to permit the operator after the tumbling action is completed to quickly and efficiently separate the furs and the sawdust or other tumbling material used.

BOBBING AND SPINDLE CONNECTION.—C. NORDELL, Glibertville, Mass. An object of the invention is to provide a bobbin holding mechanism which depends on centrifugal force to form a friction connection between the revolving shaft and the bobbin. A further object is to provide a device of the character stated which will be extremely simple in construction and durable in use.

MECHANICAL MOVEMENT.—G. MULLER, 103 Schley St., Glendale, L. I., N. Y. The invention relates to mechanism for converting reciprocating motion into intermittent rotary motion; its object is to provide a mechanical movement especially designed for intermittent feeding purposes and which is simple and durable. Another object is to reduce the wear of the working parts to a minimum and to insure proper functioning of the parts without danger of binding or sticking.

SUCTION CONTROLLING DEVICE.—L. J. DELLERT, 176 Russell St., Brooklyn, N. Y. This invention relates to grinding and polishing machines having a plurality of grinding or polishing wheels provided with dust receiving hoods connected by branch pipes with a main suction duct connected with a suction fan to produce suction and carry off the dust and other particles, arising by the operation, to protect the workmen against inhaling the particles.

CLOCK.—C. H. ANDERSON, address H. R. Kleinbach, c/o Title Guarantee Trust Co., Los Angeles, Cal. This invention has for an object to provide a construction wherein the time indicating means is arranged so that a number will indicate the hour, and an oscillating point the minutes. A further object is to provide means which is capable of being connected to ordinary clock mechanisms now in common use.

POST FOR SCALES.—G. G. and E. L. VOLAND, 48 Trinity Place, New Rochelle, N. Y. The invention has for its object to provide a post for scales, having means to indicate when the post is in true vertical position. As a means of determining the vertical position of the post a plumb is provided which is secured to the transverse member of the scale, it being possible to compare the position of the plumb relatively to marks on the base of the scale.

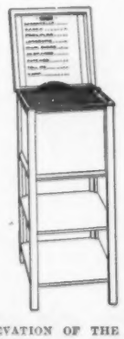
METHOD OF TREATING PEAT.—W. W. BLAIR, 141 Milk St., Boston, Mass. This inventor has been granted two patents of a similar nature which relate to a process for the treating of peat for fuel purposes. Among the objects of the inventions is to provide a machine for macerating and blocking the peat. The two processes of treatment consists of macerating the freshly dug peat and pressing the same into blocks, and compressing unmacerated peat into blocks, drying the blocks and then immersing the blocks in an oil bath to impregnate them with a fuel oil.

Musical Devices

PLAYER PIANO ACTION.—W. J. WODRASKA, 1290 1st Ave., New York, N. Y. Among the objects of the invention is to provide a player piano action of the most compact and simple construction adapting it for cheap manufacture. Another object is to provide for each pneumatic or pair of vertically alined pneumatics a single and detachable valve block, the same providing for easy inspection or repair of any valve or associated parts without disturbing any of the other valve mechanisms. A further object is to provide valves so balanced as to be most responsive to the pneumatic operation.

DISK RECORD HOLDER.—G. E. FOSS and H. G. JENSEN, c/o G. E. Foss, 1638 N. Avers Ave., Chicago, Ill. The invention relates to holders for disk phonograph records. An object is to provide an inexpensive holder in which the records may be held compactly, means being provided for identifying any record and for moving it forwardly, whereby the record may be easily withdrawn. A further object is to provide a holder which is adjustable so that records of various sizes may be held.

RECORD CABINET.—E. C. FREMAUX, Rayne, La. The invention relates to that class of cabinets which are adapted to hold disk talking machine records. The primary object is to provide a simple and practical cabinet which



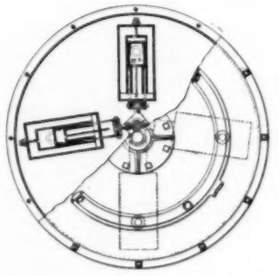
AN ELEVATION OF THE DEVICE

will insure the records being kept in their proper holders, each compartment having an individual locking device whereby the records may be selectively removed, and means for automatically and collectively locking the remainder of the compartments upon unlocking one of the compartments; when a record is removed it will be impossible to replace it in the wrong compartment.

FREE SOUNDING BOARD.—G. VIRZI, 341 E. 124th St., New York, N. Y. This invention may be applied to sounding boards of all kinds, especially all sorts of stringed instruments. The invention comprises the combination of a main sounding board, an auxiliary a character to prevent leakage between the two to hold the auxiliary board in definite spaced relation to the main sounding board, the securing means including a rib secured to one of said boards throughout its length, and having at least one integral extension to which the other sounding board is attached.

Prime Movers and Their Accessories

INTERNAL COMBUSTION ENGINE.—A. P. HARDWICK, Box 231, Chowchilla, Cal. An object of this invention is to provide a double acting four-cycle internal combustion engine embodying as one of the principal features a reciprocating piston capable of compressing charges on both sides of the head and the



A SIDE ELEVATION OF THE CASING PARTS BEING BROKEN AWAY

cylinder heads between which the piston reciprocates. Another object is to provide a pivotal mounting for the relatively fixed cylinders, through the medium of which the cylinders may oscillate to accommodate the positions of the reciprocating piston without the use of a wrist pin.

ROTARY ENGINE.—C. MULLNEX, Tolley, N. D. This invention is adapted for embodiment in either an engine or a pump and is adapted to employ any suitable motive fluid such as steam, air, or gas. The general object is to provide for the automatic sliding of the pistons to the power position and return without providing a side pressure thereon such as would cause binding of the pistons in the rotor, and to provide a construction of a character to prevent lackage between the rotor and starter.

ENGINE.—E. SARJENT, Kingfisher, Okla. The invention relates more particularly to a compound engine in which the otherwise waste gases are utilized to drive an expansion engine, which later may be utilized as a starting means for the internal combustion engine, a portion of the exploded gases from the internal combustion engine being stored in a receiver and supplied to the expansion engine as desired, the supply being under control.

VALVE EXTRACTOR.—E. T. LIESS, P. O. Box 512, Huntington, N. Y. The particular aim of this invention is to provide a device adapted for the extraction of valves from an internal combustion engine. A further object is to provide a device which can be made of any suitable material, preferably high grade steel, which may be made very light and strong, of cheap construction and easy to apply.

Railways and Their Accessories

TRAIN COUPLING.—J. B. HOLLANI, 850 W. Fayette St., Baltimore, Md. An object of the invention is to provide a car coupling in which the brake and signal lines are operatively connected and combined in such a way that when two of the couplings are joined, as between two connected cars, a fluid tight connection will be established at once, such connection remaining firm regardless of the relative movement of the coupling members.

PULVERIZED FUEL BURNING DEVICE.—J. DICKSON, U. S. Natl. Bank Bldg., Vancouver, Wash. The invention relates more especially to devices for enabling locomotive engines to make use of pulverized fuel. An object is to provide a device by which pulverized fuel may be introduced into the combustion chamber of a locomotive by means of a stream of heated air so that the fuel is substantially consumed, leaving a relatively small amount of ash and giving a maximum quantity of heat.

(Continued on page 438)

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Making the Hetch-Hetchy Dam Itself

(*Continued from page 422*)

The tunnel level is really some distance from the very bottom, being at a depth of 575 feet. The excess depth of the shaft provides for a special pocket equipped to load skips by gravity and for a pumping sump. Another shaft providing for access to the tunnel is known as the Second Garrotte shaft. Its full depth is, or will be, about 820 feet, though the tunnel grade is only 756 feet below the surface.

In driving the headings, a round of 18 to 24 blasting holes is provided. When these are exploded, an advance of about 5 feet is made. The excavation is made in full section at single operations, so that no bench is left for later removal. The tunnel is ultimately to be lined with concrete. The minimum thickness of the lining is 6 inches. The cross-section is of horse-shoe shape, the toe of the shoe being naturally at the top.

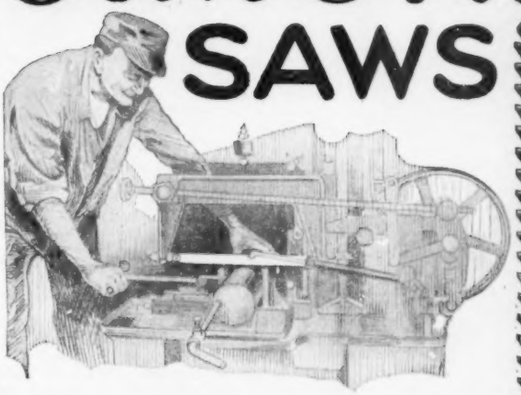
The power house which is located at Early Intake and whose pressure water comes from Lake Eleanor operates under a head of 346 feet and has a capacity of 4,000 hp. The use of timber flumes as part of the conduit which brings water from the diversion dam on Cherry River seems to have been dictated largely by the consideration that upon certain very precipitous mountain sides it would have been exceedingly expensive to excavate for a concrete canal. Later on, when conditions are more favorable, it is proposed to replace the flumes by tunnels, and to provide the necessary cross-cuts. The tunnel work may then be done without interruption to the operation of the plant. The manner of constructing the flumes on the steep mountain sides is of interest. A certain amount of excavation had to be done in order to provide for the support of the footings. This was carried to bed rock. The under part of the framing was put in place and the floor laid. A track was constructed of wooden rails and push cars loaded with lumber were shoved along on it. An immense amount of lumber was consumed—upward of 1,300,000 board-feet. The city cut this lumber at its own saw-mill, from which it went to the points of use.

The steel penstock is 42 inches in diameter. From the forebay down to the turbines which it serves, it is 530 feet long. The thickness of wall varies from 3/16 inch to twice as much. Naturally, the heavier wall is used in the lower sections, where the hydrostatic head runs up to a maximum pressure in the neighborhood of 150 pounds per square inch. The wheels are Pelton-Francis turbines operating in vertical planes. They are direct-connected to their respective generators. The current is developed at 2,300 volts, but is stepped up to 22,000 for transmission purposes. The lines are estimated to extend 19 miles on the west and 14 on the east. There are three units, although the plans called for the output of but two, the third being reserved for emergency use. The transmission line to the west lies in the same vertical plane with the tunnel underneath.

The Early Intake power house performed a certain amount of service during the fuel shortage of the Great War. It began operation as early as May, 1918, at a time when its full capacity was not required for aqueduct work. In September, the Power Administrator ordered that the transmission line be connected with that of the Sierra & San Francisco Power Company for the purpose of supplying surplus energy at points served by this commercial concern. In three days after the date of the formal order, the connection had been made and the delivery of surplus energy begun. In fact during the fiscal year 1918-1919, of the total output of 18,687,400 kw.-hrs., 13,505,621 kw.-hrs. were delivered for use other than that connected with the aqueduct.

The muck handling machine already referred to is a self-propelling apparatus.

SIMONDS
SAWS



Simonds

Hack Saw Blades

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RECENTLY PATENTED INVENTIONS

(*Continued from page 436*)

CUT-OFF RELIEF VALVE FOR AIR BRAKES.—E. P. Clauss, 26 Maple St., Lyons, N. Y. This invention has for an object to provide a construction which will act as an angle cock substantially in the usual manner, but will act to bleed the system when turned off. Another object is to provide an angle cock which will bleed the system when turned off both in front and rear of the cock, and to be arranged so as to be unlappable.

RAIL.—N. I. Woolsey, 5474 Asbury Park Rd., Huguenot Park, S. I., N. Y. The invention relates to railroad and street car tracks; its object is to provide a rail arranged to permit of quickly replacing a worn out head by a new one without removal of the web and base from the track. Another object is to provide a protected passage for the electric conductor, and to prevent spreading of the rails.

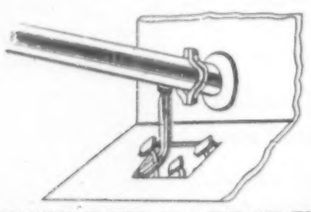
Pertaining to Recreation

PUZZLE.—V. A. Hlasko, 36 Holland Park, London, England. The primary object of the invention is to provide a toy such as are commonly known as puzzles in which a plurality of element of different sizes are movable relatively to each other to position them according to their value, it being understood that each of the elements is given a different value.

Pertaining to Vehicles

LOCKING DEVICE FOR AUTOMOBILES.—J. P. Geraghty, 493 Grove St., Jersey City, N. J. Means are provided within the hood enclosing the motor to prevent starting the motor and the hood is locked to prevent unauthorized persons from gaining access to said means. A plurality of devices are provided for rendering various parts of the motor inoperative so as to prevent even experts from stealing the car.

LOCK FOR AUTOMOBILES.—C. W. Nixon, 400 Bourbon St., New Orleans, La. The invention relates to locks for automobiles to prevent theft of the machine. An object is the provision of a locking device, which effectively locks a clutch pedal in neutral position, such device after being attached forming an



A FRAGMENTARY VIEW OF A FORD CAR WITH LOCKING DEVICE APPLIED

integral part of the machine, and constructed to prevent the prying or bending apart of any part of the device, in an attempt to remove the same from the pedal.

AUDIBLE ALARM FOR VEHICLES.—L. H. Morgan, c/o The Ellengton Apln., Cleveland, Ohio. Among the objects of the invention is to provide means whereby when a vehicle is left standing unguarded it may be so adjusted that it cannot be moved without authority without the sounding of a loud alarm. The object is to provide an alarm device which may be easily applied to any standard vehicle in which there is a rotary shaft.

WIRE WHEEL.—T. A. Bowers, 64 Sudbury St., Boston, Mass. An object of this invention is to so temper and crimp the spokes as to materially increase the strength of the wheel by taking up all internal stresses set up in the spokes under service conditions, the purpose being to make the wheel resilient and to increase its ability to withstand shocks and strains.

VEHICLE ROUTE INDICATOR DEVICE.—E. Siegel, c/o Siegel Bros., 154 Nassau St., New York, N. Y. Among the objects of the invention is to provide a road indicator by means of which road directions and land marks over a relatively great distance may be provided in a compact space, the mechanism being so arranged that the road characteristics or land marks may be shown upon a relatively large scale, and before the said marks are actually reached whereby the driver will have ample warning of same.

STAND.—E. H. Kelley and G. A. Stewart, Jr., South Brownsville, Pa. This invention has for its object to provide a stand especially adapted for use in repairing and testing engine cylinder blocks, particularly of the Ford type. The invention comprises a base, having at one side legs, and at the other side wheels for supporting the base, the base and legs being of angle material.

SIGNAL FOR MOTOR VEHICLES.—E. P. Goodchild, 2116 Monroe St., Spokane, Wash. Among the objects of the invention is to provide a signal which will indicate to following vehicles, and to those in front, the intention of the driver in regard to turning or stopping. The signal is in the form of an outstretched hand, adapted to be normally held in a casing, but extended and withdrawn at will by the driver.

TANK LOCK.—F. H. Rundall, 343 Peary St., Fall River, Mass. The invention relates more particularly to means for locking the caps or plugs of gasoline tanks on automobiles, an object being to provide a device which will prevent the theft of gasoline while tre car is standing in garages or elsewhere, as the cap can be removed only by an authorized person with the proper key.

TEMPERATURE INDICATOR FOR ENGINE WATER CIRCULATION.—G. P. Pitkin, Bergenfield, N. J. The invention provides improved means for supporting a thermometer on the dashboard of an automobile, airplane or other similar device. The thermometer is in direct communication with the water circulating through the cooling system so that the operator can see at all times the temperature of such water.

DIFFERENTIAL.—G. W. Wilkin, Box 962, Grangeville, Idaho. The primary object of the present invention is to provide a very simple differential gearing which will transmit power to all four wheels of a vehicle and which will permit of the turning or rotation of all four wheels independently of each other. Under normal conditions it will transmit a maximum of driving power to each wheel.

PNEUMATIC WHEEL.—E. B. Hudson, 519 Crawford St., Middletown, Ohio. This wheel is so constructed as to eliminate punctures, blow-outs, and rim cuts. The pneumatic element is not placed at the periphery of the wheel but is introduced between the wheel and the hub while a solid rubber tire is mounted on the rim of the wheel.

SPRING WHEEL.—W. A. Burger and W. Gross, San Francisco, Cal. An all metal spring wheel is provided by this invention which is designed to take the place of a pneumatic tired wheel. The rim is composed of a series of movable sections which are cushioned by radially extending springs. The tension of these springs may be varied at will.

CONVERTIBLE AUTOMOBILE BODY.—J. J. McGuire, 21 Sherman Ave., Yonkers, N. Y. The object of this invention is to provide a new and improved convertible automobile body arranged to permit of its being converted into a limousine, runabout, open car body or partly open car body. Another object is to provide sleeping accommodations in the limousine body.

OIL CUP.—L. H. Williams, c/o R. L. McDonald Mfg. Co., Box 1177, St. Joseph, Mo. The invention relates to a form of oil cup that is adapted to be attached directly to a leaf-spring of an automobile whereby a lubricating oil is fed as needed between the leaves composing the spring. A further object is to provide a device that can be quickly attached or detached without the necessity of using any tools.

AUTOMOBILE COWL ATTACHMENT.—J. H. Coffman, 201 Waverly Way, Atlanta, Ga. This invention has for its object the provision of a cowl construction whereby to provide a gutter located beneath the juncture of the hood with the cowl whereby to prevent water from dropping down onto the coil box terminals and ignition wires connected therewith.

Designs

DESIGN FOR A STAND.—W. F. Faas, Cleveland, Ohio.

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A Magnetic-Proof House for the Workers

(*Continued from page 423*)

instruments and appliances for the investigational work is entirely non-magnetic in character. The heating is provided by a central steam-heating plant in the main laboratory about 250 feet distant. The radiators are of copper tubing. The steam, return, gas, hot and cold water, drain and air pipe lines and lead-encased electric cables are hung in a concrete tunnel sufficiently large to allow alterations and additions. All of these lines and their mountings are non-magnetic in character within the building and for a distance of forty feet outside. The laboratory tables and galvanometer mountings are of carefully selected soapstone free from magnetic impurities. Provision is made for three alternating current circuits and fourteen direct current circuits between the laboratory and the main building.

The plans, design and details of the Experiment Building were prepared by J. A. Fleming of the Department Staff and the work carried out under his direction.

The Romance of Invention—XVIII

(*Continued from page 424*)

met calculates that the saving amounts to three per cent of the total capacity of the ship, which saving is accompanied by the further advantages of saving in weight; for electric drive units weigh less than any other type of drive, without consideration of the fifty or sixty tons of weight saved in the elimination of the usual propeller shaft, bearings and gear.

Personally, Mr. Emmet is a fluent talker upon subjects which interest him, possessed of a viewpoint almost wholly scientific, and with a modesty of thought about his work which is very pleasing. From childhood he had a love for mechanical things and as a boy did much carpentering and other mechanical work. He states that he had "no remarkable skill or facility, but the enterprise to begin difficult jobs and the persistence to carry them through."

Much of the faith and initiative necessary to start and carry through important new work has been his, in addition to a large amount of invention and much thought and experimentation both as to proportion and general economic characteristics and as to details of construction. Of his work with the General Electric Co. he says: "In all my work at Schenectady I have held to engineering and avoided as much as possible executive activities, but have had to do much in organization and direction of new undertakings and also in selling new things—which can generally be accomplished by those who have complete faith based upon positive knowledge. I have always realized that there was a great number of possible undertakings in which the energies of a good engineer would bear good fruit, and I have generally had many such in view; but I have confined my best efforts to a few important campaigns which in my opinion conduced to large developments of the electric art.

"Since I have been in the manufacturing end of the electric industry, I have mainly devoted my energies to four large undertakings. The first of these was the development and promotion of electric distribution by alternating currents, a movement in which many were engaged but in which I planned, and to a large extent executed, some of the most important initial steps. This activity lasted from 1894 to 1905.

"My next important undertaking was the Curtiss turbine development, which extended from 1900 to about 1912, when I began to leave its principal direction to others.

"My third important activity was the electric propulsion of ships. This, as applied to warships, extended from 1909 to 1919 and the campaign is at present being extended to merchant ships.

"My fourth important activity has been my mercury-vapor process, which has been worked upon since 1913 and has not yet reached a state of commercial development. This process is entirely my own work, every detail of conception, experimentation and actual design has been worked out by me, with practically no help but that of my personal assistants and draughtsmen working in my office. Very important demonstrations have been made, a large commercial application is now being begun, and I believe that the process will develop very great importance."

Mr. Emmet has more than a hundred patents to his credit, ranging over the whole field of electrical and steam engineering. He has just received the Edison medal, a distinguished honor which his conferes in electrical and steam engineering circles say has been well and honestly earned.

A Mechanical Age for the Farm

(*Continued from page 426*)

oratory, farm lighting laboratory, farm hydraulics laboratory, and lecture room. There is a special building at the rear of the main building for the tractor testing work.

A great number of the students who take these courses go back to the home farm, but those who aspire to the most advanced work often plan on entering the agricultural engineering field as professional men. There has been a shortage of men who are professionally trained in these lines and the large implement and tractor companies are on the alert for the best talent. It was only a comparatively few years ago when 100 students taking work in agricultural engineering was almost an epoch-making event but there are now over a thousand a year taking such work at the University of Nebraska. Needless to say, not all of the students take all of the courses but agricultural engineering has come to be recognized as one of the branches to be learned by the scientific farmer. No better illustration of the great demand for mechanical information on the farm can be gained than the fact that the two or three letters of inquiry a week have now often passed the 500 mark.

But the tractor testing probably represents the most important piece of work attempted. The tractor purchaser is not

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contains Patent Office Notes. Decisions of interest to inventors—and particulars of recently patented inventions.

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in a position individually to make tests to show whether or not a tractor comes up to the claims made for it. One of the difficulties in purchasing a tractor has been the fact that horse-power ratings have not always been true indications of tractor capacity. Some manufacturers have overrated their tractors, others have underrated. The result has been that farmers have sometimes secured tractors too large or too small for the work to be done, and have also secured machinery too large or too small for the tractor. The results of tractor tests under the new tractor law will give tractor purchasers the information they need regarding horse-power capacity of tractors.

Under the law each tractor manufacturer must deliver his tractor to the university and a temporary permit is issued until the test is completed. One provision of the law is that the manufacturers cannot use the results of the tests for advertising purposes unless the complete results are also published, thereby preventing them from telling only the good points of their tractor in the test. The following is a complete list of the tests that the tractors are obliged to pass:

1. Drawbar work at one-third load to full load for 12 hours. This test gives opportunity for the tractor to limber up.

2. Brake horse-power test at rated load and rated speed for two hours. This test will show whether or not the tractor will carry its rated load on the belt; also show fuel consumption at rated load.

3. Brake horse-power test at load varying from maximum to no load with all engine adjustments as in test (2) for one hour. This will show fuel consumption and speed-control on varying load.

4. Brake horse-power test at maximum load for one hour with governor set as in test (2) and carburetor adjusted for most economical operation at one-half load. This test will show fuel consumption at one-half load.

6. Drawbar horse-power test at rated load for ten hours. This test will be made on a half-mile cinder track and will show whether or not the tractor will carry its rated drawbar load continuously; also shows fuel consumption on drawbar work.

7. Maximum drawbar horse-power test. This test will be a series of short runs with an increase of load for each run until the engine is overloaded or the drive wheels slip excessively.

8. Miscellaneous. This may include investigation of work on inclines, turning radius, effectiveness of brakes, or any feature of the tractor which may seem to require special observation.

9. Tractors will be under observation for endurance throughout the complete test as outlined above.

A half-mile cinder track has been constructed for the tractor drawbar tests. A special dynamometer car ras been built on a tractor chassis, with an electric generator in place of the engine. A tractor dynamometer gives the record of the drawbar pull, distance traveled and time.

To make the tests of the tractor work on the belt an electric dynamometer has been installed in a building erected for that purpose. Fuel consumption is recorded by drawing the fuel from a tank mounted on a scale. The entire tests are passed on by a board of three engineers. Needless to say, all the operating of the tractors is done by the university, although the company may have a man present.

It was a noteworthy fact at the dedication of the new building that several of the speakers called attention to the somewhat primitive agricultural implements that they were compelled to use as boys on the farm. The last thirty years have seen marvelous strides in the development of factories, and the next thirty years will see the development of some wonderfully efficient farms. In truth, the farm is a factory and the farmer is still entitled to all the labor-saving devices that can be mobilized for his aid.

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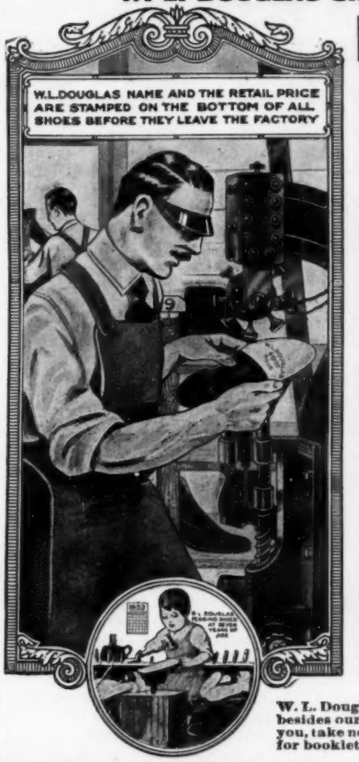

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4. All essays must be in the office of the SCIENTIFIC AMERICAN by November 1st, 1920.

5. The Editor of the SCIENTIFIC AMERICAN will retain the small sealed envelopes containing the competitors' names and addresses, which will not be opened until the competitive essays have been passed upon and the winning essay selected.

6. As soon as the judges have selected the winning essay, they will notify the Editor, who will open the envelope bearing the proper pseudonym and revealing the competitor's true name. The competitor will at once be notified that he has won, and his essay will be published in an early issue of the SCIENTIFIC AMERICAN.

7. There shall be but one prize, of FIVE THOUSAND DOLLARS, to go to the author of the best essay submitted.

8. The SCIENTIFIC AMERICAN reserves the right to publish in its columns, or in those of the SCIENTIFIC AMERICAN MONTHLY, or in book form, any of the essays which may be deemed worthy of this. Aside from such rights, the essays shall remain the properties of their authors; but no manuscripts can be returned.

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(*Continued from page 428*)

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Excellent results have been realized in handling entire fish when suitably cut up or ground to make it possible, after admixture with the saline electrolyte, to pump the stuff through the extracting unit. No matter whether the flesh of shark, menhaden, herring, etc., be used, the quality of the oil and the quantity are both much superior to the yields secured by other means. As might be expected, the Rogers-Bennett system is showing its flexibility in dealing with butcher's trimmings and the better grades of fat. By the best practice in vogue the tallow yield does not exceed 45 per cent, while the electrolytic unit gives 60 per cent and the oleo recovery reaches 90 per cent by the newest apparatus as against a maximum of 82 per cent by up-to-date commercial equipment.

These gains in output are likely to pay handsomely. Just how much so can be grasped from a report issued by the Bureau of the Census covering the three-month period ending June 30 of the current year. The factory production of fats and oils was as follows: Fish oils, 19,737,357 pounds; animal fats, 436,674,135 pounds; grease, 100,799,825 pounds; and vegetable oils, 276,647,937 pounds. And this brings us to the adaptability of the electrical process to the extraction of oils from vegetable sources.

Up to the moment, the method has been applied only to copra, the well-known form of dried cocoanut from which we get a great deal of the basic material for nut butter and other edible commodities, not to mention oil for various purposes. Copra has a cellulose fiber which necessitates the grinding or thorough macerating of the cocoanut in order to stimulate the fullest electrolytic action. When this is done, the extraction of the oil is practically on a par with that effected when dealing with animal matter, and the product is of a high grade. There is every reason to believe that this novel system will prove a boon in the extraction of oil from linseed, soya beans, castor beans, cottonseed, peanuts, corn, and many other fatty or oil-bearing vegetables.

San Francisco's Traffic Convention and Street Safety Show

By C. W. Geiger

(*Continued from page 431*)

word signs which govern traffic, just as the traffic officers do today. These signals may be manipulated locally or connected with a central timing device which operates for any desired length of time at any desired interval. This device was perfected by a Los Angeles inventor, and is now being installed at several street intersections in that city.

The semaphore is placed on an ornamental post at the property line of the intersection of streets, so as to be visible to all traffic. Four devices at each intersection, with the semaphore, a light and a bell giving three signals at the same time, permit traffic to proceed or stop. These signals are connected with a central timing device operated automatically for any length of time desired, so that an entire street may be thrown open for traffic north and south, and closed east and west. Then, on the other hand, all east and west streets may be thrown open for traffic and the others closed, or if it were desirable to open a street north and south at one intersection and close it at the next intersection sychronously, it may be done. There is in fact no movement of traffic which can be suggested that cannot be accomplished with this regulator. The signals are plainly visible and audible day or night, and always in operation. Traffic is always regularly moving, and for any time desired in any direction with absolute safety.

There is provided either central or local control at each intersection, at all times, so that an officer may instantly assume control, at any intersection, at will. It has been suggested that this device may prove practical to supplement the regulation at every congested intersection, with a traffic officer during certain hours; however, this is not necessary, as the device completely regulates the traffic. The traffic officer, however, will be used at intervals, as there will be infractions of the traffic regulations, and this device will aid the officer in enforcing regulation, as he will not be required to be stationary.

The regulator can be used by the fire department and the police department in many ways. In order to permit fire department equipment to pass, traffic on any or all streets can instantly be brought to a standstill, if desired. This is possible because the system is so arranged that all four arms bearing the word "stop" can be raised, and all four arms bearing the word "go" lowered, thus stopping traffic.

Use of Pulverized Lignite for Fuel in Australia

A NEW Australian syndicate has been registered at Melbourne "to mine, process, and deliver to prospective customers throughout the Commonwealth" pulverized lignite, or brown coal, which, it is claimed, can be used for steam generation or metallurgical purposes with most satisfactory results. The syndicate controls various brown-coal deposits throughout the State of Victoria, said to contain over 250,000,000 tons, and mining operations are well under way.

Many novel features have been introduced in mining and air-drying the lignite, as well as in the process of pulverizing and burning. The plans for the entire work were prepared by Roy N. Buell, of San Francisco, Cal., chief consulting engineer, and the plant which the company recently built at Abbotsford (a suburb of Melbourne) was erected under his personal supervision. His views on the subject of the treatment of brown coal in Australia are embodied in this report.

The most striking improvement in this new method of treating lignite, which is known as the "Buell system," is the means of air-drying at the mines, whereby the moisture content is reduced from 50 to 25 per cent in seven days. Briefly described, the process is as follows:

The lignite is mined in either shafts or open cuts, the coal crushed on the spot to egg size, then hoisted to the air-drying tipples at the surface by bucket conveyors. After drying about seven days, the coal is relieved of practically half of its moisture content and is ready for final treatment. This final process, which should be undertaken near the place where the fuel is to be used, consists of again crushing the coal—to about ½-inch mesh—after which it is passed through a rotary drier, where the moisture content is reduced to about 10 per cent. The fuel is then pulverized, separated by air, and stored in bunkers.

To use it is blown through pipes, where it is mixed with air in quantity 10 per cent in excess of requirements and ignited at the tip of an adjustable burner, which enables the length and width of the flame zone to be most accurately gaged. Boiler tubes and baffles are kept clear of ash by soot blowers and suction conveyors carry off the ash to any desired place of disposal. Three per cent of the power generated is required to operate the plant, and one experienced man can fire a whole battery of boilers or kilns.

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